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AGRICULTURAL NEWS

A FORTNIGHTLY REVIEW

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	PAGE.		PAGE.
Agriculture in Barbados...	7	Gleanings	12
Australian Wines	11	Insect-Eating Birds in St. Vincent, Protection of	15
Bee Keeping—A Possible Help to Cotton Growers	5	Insect Notes:—	
Cane *versus* Beet Sugar ...	3	An Outbreak of Field Crickets	11
Cattle Raising in British Guiana	13	Clytus Devastator, A New Pest of the Florida Orange	11
Co-operation among Agricultural Workers	1	Cockroach Control... ...	11
Cotton:—		Entomology in Jamaica ...	10
Acreage Under Cotton in St. Vincent	7	Items of Local Interest ...	7
Further Development in regard to British Cotton Growing	6	Maize, Root System of ...	8
Sea Island Cotton Market	6	Market Reports	16
Cowpea, Notes on Inheritance in The	4	Notes and Comments ...	8
Departmental Reports ..	14	Plant Diseases:—	
Farm Tractors in America	9	Summary of Notes on Fungi and Plant Diseases in 1918 ...	14
Fish, A Useful Little ...	8	St. Vincent Cotton	9
Gacia Plants from Teneriffe	9	West Indian Products ...	15

Co-operation among Agricultural Workers.

UNDER the heading which appears above, there was an article in a recent number of the *Journal of Economic Entomology* by Mr. John J. Davis, an officer of the United States Bureau of Entomology.

In the first paragraph there appears a quotation from an address by Dr. S. A. Forbes, before the Entomological Society of Philadelphia, on the ecological foundation of applied entomology: 'It is when we search for specific reasons for our successes here and our failures there that we are driven to a scrutiny and an analysis of controlling conditions of every description, and so find ourselves involved in studies so far outside entomology, commonly so-called, that we are obliged to apply for assistance to the physiologist, and the chemist, and the physicist, and the meteorologist, and the geographer, and the agriculturist, and the animal husbandman, and the bacteriologist, and the physician, and the sanitarian, or in a word, to the ecologist, who from the nature of his studies, must, if he is thoroughly to cover his field, be something of each and all of these, and still something more.'

The ecologist is a product of recent developments in science, in consequence of the high degree of specialization which has been required of scientific workers. None but the latest editions of dictionaries contain the word ecology, and the functions of the ecologist must be gathered from such statements as the foregoing. From that we gather that the ecologist has to do with the functions of all the organs of plants studied in relation to all the conditions of environment.

This definition will stand for the plant ecologist, the economic botanist or agronomist, who in agricultural work is likely to be the most prominent of ecological workers. The entomologist may be an ecologist in that he may be studying insects in relation to their reaction to environment, and the term might be applied to dairy men and poultry men if they become sufficiently versed in the reactions of their particular group of domestic animals to all the influences of environment.

The following quotation from the article already referred to indicates the line along which co-operation may well be practised, and shows the necessity for the agricultural specialist to maintain an open mind with regard to general recommendations:—

'Agriculture is a study of the interrelations of all branches of agriculture, a complex of gigantic proportions, and too great for the conception of a single mind. In the early days of scientific agriculture the workers were few, and each was by necessity more or less acquainted with the most improved practices in all branches of agricultural work, as evidenced by the fact that the teacher of agriculture was frequently obliged to conduct classes in soils and crops, horticulture, animal husbandry, etc. To be sure he may have been especially interested in some phase of the subject, but nevertheless a general knowledge was essential. This plan of work has gradually changed, until we have now the various investigations for each branch, and even these are sub-divided, and thus we have specialists for the various sub-divisions. For some years, and especially since taking up intensive studies on insect problems of general farm crops, the writer has recognized the need of co-operation and freer intercourse between the different and increasingly complex branches of agricultural education. We feel that there is no more important work than the co-ordination of the many farm problems, and this cannot be treated as an individual problem, but must be the combined work and ideas of complex investigations from every branch of the subject. Too often the entomologist, in considering methods of control, attacks the problems from the purely entomological standpoint, neither thinking, nor apparently, caring whether the suggestions may meet with the requirements of the approved plan of the agronomist, chemist, or forester. Recommendations have been made seriously conflicting with approved farm practices which could doubtless have been revised to meet all requirements, had the author been familiar with approved farm methods, or better, if he had consulted with specialists in that phase of agriculture touching on his recommendations. It cannot be expected that an entomologist shall be familiar with all developments and approved practices in agronomy, nor the agronomist with problems entomological, but it is possible for the agronomists and entomologists, plant pathologists and entomologists, and others, freely to consult on problems which are directly or indirectly connected, and thereby reduce, to a minimum, conflict in advisory measures. The agronomist can see points of utmost importance in the control of insects which might never be considered by the entomologist, and the chemist would see features from his point of view which would be of invaluable help, and so on indefinitely, and it occurs to the writer that there lies within our reach a wonderful source of information which would be made available by incorporating in our routine freer consultation with our co-workers, to say nothing of the benefit derived by securing recommendations of mutual value. Entomologists are not alone to blame for this condition; indeed they have in known cases endeavoured to co-operate and seek advice from other branches of agriculture.'

Mr. Davis closes his paper with the following remarks:—

'The above discussion is intended to emphasize the need of keeping closely in touch with workers in all branches of agriculture, and to encourage freer exchange of ideas and plans between agronomists, entomologists, plant pathologists, chemists, foresters, animal husbandmen, meteorologists, and others. Likewise the agricultural investigator, and especially the entomologist, should not lose sight of the ecological applications, for, as Doctor Forbes has said, students in entomology should be required to complete certain courses in ecology as prerequisites to their courses in entomology; or, at least, ecology should be required as a necessary part of entomological training. This likewise applies to the agricultural student. He is required to complete certain courses in agronomy, chemistry, farm mechanics, animal husbandry, entomology, etc., and here his requirements end. He becomes familiar with soils and crops from the point of view of the agronomist, with swine or poultry problems from the conception of one who has made a special study of these particular subjects, but the average student is not able to co-ordinate these studies as could be done if he had first obtained a knowledge of applied ecology in its relation to agricultural topics.'

These ideas find application in the work of planters and of the officers of agricultural departments; they tend to show that co-operation and frequent intercourse, with the consequent interchange of ideas, are essential for the successful solution of agricultural problems. While times are easy, and troubles few, an individual may follow his own line of action in comparative isolation, and may be quite successful: on the other hand, under altered conditions he may fail, and fail in circumstances in which freer interchange of ideas might have saved him from disaster. The ideas expressed in this article lie at the root of the prosperity of agricultural communities.

SUGAR INDUSTRY.

CANE VERSUS BEET SUGAR.

Information has recently come to hand that British makers of such commodities as jam, chocolate and condensed milk have experienced difficulties, which they attribute to the use of cane sugar in place of the beet sugar which they formerly employed in their industries. This is unfortunate, as it may lead to some preference being manifested for beet sugar, and to a desire in some quarters to obtain access once more to supplies of continental beet sugur furnished by enemy countries.

It would be well if the facts were carefully investigated, so that the nature of the difficulties may be clearly understood, and steps taken to remedy them.

It is understood that the experience of some makers of jam and of condensed milk is that their goods manufactured with the class of cane sugar recently available exhibit a tendency to ferment. This defect cannot be attributed to the sugar as sugar, for it is admitted that pure cane sugar and pure beet sugar are indentical substances. The defects, therefore, must lie with such impurities as were contained in the sugar used.

Owing to the fact that the impurities of ordinary beet sugar are extremely unpleasant, having an offensive taste and smell, it is essential that the refining of beet sugar shall be very thoroughly accomplished; if not, the resulting sugar is unpleasant, and is not acceptable to the user. On the other hand, the impurities incidental to cane sugar are quite pleasant both to smell and taste; consequently cane sugar may be passed on to the market in a less perfectly refined condition than beet sugar, and still be acceptable to the ordinary user. Indeed, there are many grades of cane sugar in common use which are not refined sugars in the strict sense of the word: they are made direct from the cane juice by careful methods, without being submitted to refining processes.

It is more than probable that the manufacturers' difficulties referred to above are to be explained by the fact that the cane sugars, recently placed at their disposal by the authorities regulating the supplies of sugar-cane, were cane sugars which had not been submitted to a thorough refining process, such as results from treatment with animal charcoal. In such a case it is conceivable that organisms capable of causing fermentation exist in the sugar, and so pass into the products of manufacture, ultimately leading to their spoiling. Had the sugar been thoroughly refined, preferably by filtration through animal charcoal, it is expected that these fermentive organisms would have been removed. This being so, it may be asserted that it was not the sugar that was at fault, but its method of refining.

It is well known that in the stress of recent times one difficulty experienced in Great Britain was the obtaining of refined sugar, so much so that unusual steps had to be taken to get supplies of sugar refined in America for British use: British refineries were too few in number and too small in capacity to produce the needed quantities. It will be readily recognized that these conditions were conducive to the furnishing of only partially refined sugars to the manufacturers of jams and condensed milk.

This recourse to American refineries is a consequence of the fiscal policy before the war which led to the closing of almost all British sugar refineries, thus putting a stop to an industry which in the earlier part of the last century was of great importance in the United Kingdom. From those extinct refineries, before the swamping of the market by refined beet root sugar from the Continent, there used to be produced sugar of the utmost purity, in loaves and cubes and crystals, much of it refined from crude cane sugars from the tropical parts of the Empire.

That this use of imperfectly refined cane sugar may have been the cause of the troubles complained of is rendered fairly evident by the statement of a manufacturer of chocolate, to the effect that he preferred beet sugar because it is less sticky than cane sugar. Now thoroughly refined cane sugar is no more sticky than is beet sugar, so it must be concluded that his experience referred to the imperfectly refined cane sugar.

In the work of reconstructing industries after the war sugar will play a large part, and the question of the production of cane sugar will be a vital one for many of our colonies. Sugar production in British colonies has been at a great disadvantage in the past in its struggles to compete with beet sugar, a struggle which hinged, not so much upon the qualities of the respective sugars, but upon the fiscal conditions under which they were produced and marketed. Now that these disabilities are to be removed, it is very undesirable that any undeserved stigma should attach to cane sugar, or that there should arise a preference for beet sugar, on the part of even some British manufacturers, based on erroneous grounds. A body of prejudiced purchasers in the United Kingdom might be a source of serious danger to the colonial sugar industry.

It would be an acceptable and useful national service if one of the Associations now springing up in England for the devolopment of the colonial sugar industry, and the investigation of sugar problems, were to take up this question, and investigate it thoroughly, and to give wide publicity to the results of the investigation as soon as possible. It is to be remembered that the consumption of sugar in the major industries concerned with the production of jams, confectionery, condensed milk, and allied commodities, uses a very large part of the sugar imported into the United Kingdom; consequently, anything working to the detriment of cane sugar in this connexion is a matter of grave concern. Mere declamation, or the assertion of the merit of one kind of sugar as contrasted with another, will not suffice; the matter should be thoroughly and carefully investigated.

DEPARTMENT NEWS.

Dr. J. C. Hutson, B.A., Ph.D., who for eighteen months, during Mr. Ballou's absence in Egypt, acted as Entomologist on the staff of the Imperial Department of Agriculture for the West Indies, has recently been appointed to the post of Entomologist on the staff of the Agricultural Department, Ceylon. He has already left England to take up his duties, and has probably reached Ceylon by now.

NOTES ON INHERITANCE IN THE COWPEA.

ANTHOCYANIN COLOURATION OF STEM AND LEAF STALK, AND NEW ERA PATTERN OF THE SEED COAT.

As the outcome of work carried on at the Experiment Station, St. Vincent, by Mr. S. C. Harland, B.Sc., a considerable body of information has been acquired respecting the mode of inheritance of certain genetic factors in the cowpea. Mr. Harland now furnishes the following notes, with a desire to place on record a summary of such facts as have come to light, reserving a detailed presentation of the complete results for a later date. A paper embodying the results of his investigations relating to the inheritance of colour and pattern of the seed coat, and of flower colour, has been contributed to the *Journal of Genetics* by him, and will probably appear in the near future.

In many varieties of cowpea, the region near the junction of the main stem and petioles is dark red in colour, owing to the presence of anthocyanin pigment in the epidermal cells. The same pigment is also found at the junction of the petioles with the leaflets. In other varieties pigmentation is totally absent. In crosses between pigmented and unpigmented kinds, the following results were obtained :—

F_1 generation.

Pigmentation present.

F_2 generation.

Five families were grown, and segregation occurred into the parental types in the following proportions:—

Plants.	Pigmented.	Unpigmented.
171	132	39
Expectation	137·25	42·75

This ratio is close to the expected 3:1, characteristic of a single genetic difference. Several families were grown in F_3.

F_3 generation.

Of fifteen families grown from F_2 pigmented plants, four families threw pigmented only. There were ninety-one plants in all. The remaining eleven families segregated into pigmented and unpigmented, the results being:—

Plants.	Pigmented.	Unpigmented.
369	276	93
Expectation	277·75	92·25

The ratio of pigmented to unpigmented plants in segregating F_3 families is thus close to 3:1.

From F_2 unpigmented plants four families were grown in F_3. All bred true to the unpigmented condition, the number of plants being 140.

Conclusion.

From these results it may be concluded that the presence of anthocyanin colouration in the stem and leaf stalk of the cowpea is due to a single unit factor, dominant to its absence.

THE NEW ERA PATTERN OF THE SEED COAT.

The variety New Era is one of the best known varieties of cowpea, being highly valued by the farmers of the Southern States as a forage crop. The seeds are thickly and uniformly dotted with a dark blue anthocyanin pigment, the ground colour being a medium brown which deepens with age. In previous investigations [Spillman (1911), Harland (1918)] it has been noted that the Solid type of pattern, i.e. that characterizing the basal colour of New Era, is due to two factors. One of these is the Watson factor (W), and the other is the Holstein factor (H). The factor H is responsible for the type of pattern known as Holstein, while the factor W produces another type of pattern known as Watson. The factor Watson deepens the colour of the flower, changing it from the type known as Pale to the type known as Dark. Thus it may be assumed that New Era contains both W and H. Crosses have made between New Era and a variety known as Para, which was originally obtained from Brazil. A short description of the parental types is as follows :—

New Era. Pattern, solid brown, thickly dotted with blue anthocyanin pigment producing the characteristic New Era pattern. Flower, of type known as Dark, i.e. standard and wings both purple. Anthocyanin pigment present in stem and leaf stalk. The same pigment is also found in the young pod, particularly at the tip in the calyx, and at the top of the flower stalk.

Para. Seed, pale cream, almost white. Flower and also the vegetative parts of the plant devoid of anthocyanin pigment. Types with no anthocyanin pigmentation whatever are conveniently termed 'albino'

F_1 generation.

The seed possesses the characteristic New Era pattern but the dotting is not so intense. The distribution of anthocyanin colour in the vegetative parts is like that of New Era, as is also the flower colour.

F_2 generation.

Owing to the attacks of insect pests it was not possible to grow a large number of plants in the F_2, but sufficient data were obtained to render fairly clear the genetic constitution of the parental types. Three types appeared:—

1. The New Era type (including plants like the F_1).
2. A new type, different in several respects from New Era. The seed coat pattern is brown solid colour, no dotting being present. Anthocyanin is present in stem and leaf stalk, but not in the young pod, calyx, or peduncle. The flower colour is dark.
3. The Albino type.

The numerical results of the F_2 are as follows:—

New Era.	Brown.	Albino.
10	2	5

In the F_3 three families were grown. One of these was from an albino, and bred true. The other two were from F_2 plants of the New Era type, and both showed segregation into New Era, Brown, and Albino. The numerical results of these two families are as follows:—

	New Era.	Brown.	Albino.
Family 1	14	6	10
2	11	4	9
Total	25	10	19

Combining these results with those of F_2, it will be seen that the ratio of New Era:Brown:Albino is very close to 9:3:4, thus:—

	New Era.	Brown.	Albino.
Found	35	12	24
Expected	39·9	13·3	17·8

These results may be explained by assuming that two independently inherited genetic differences are concerned in this cross :—

E.—A factor which produces the New Era pattern on the seed coat, and also anthocyanin pigment in the young pod, calyx, and peduncle.

R.—A factor for pigment in the seed coat, anthocyanin in stem and leaf stalk, and colour in the flower.

E is without effect except R be present. According to this view, the cross under discussion is E r by e r. The types appearing in F_2 are, 9 E R (New Era), 3 e R (Brown), 3 E r (Albino), and 1 e r (Albino).

Since all the pigmented types possess the Solid type of pattern, it is evident that Para has both the Watson (W) and Holstein (H) factors. These are without visible effect except in the presence of the factor for pigmentation of the seed coat brought in by New Era. The statement that the factor R is responsible for brown colour in the seed coat, and anthocyanin colour in stem, leaf stalk, and flower, does not preclude the existence in the Albino type of Para of factors for flower colour and anthocyanin pigmentation of the vegetative parts, for such factors may be present and have no visible effect, except in presence of R. Thus the cross may be:—

Para (X W H r e) by New Era (X W H R E) where X is the factor for anthocyanin colour in stem and leaf stalk, W is the factor for Watson pattern and Dark flower, H is the factor for Holstein pattern, R is the factor for pigmentation of the seed coat, and E is the factor for the New Era pattern. None of the factors have visible effect except in presence of R.

References:

Harland, S. C., 1918. 'A Study of Inheritance in the Cowpea (*Vigna sinensis*)' *Journal of Genetics* (not yet published).

Spillman, W. J., 1911. 'Inheritance of the "Eye" in Vigna'. The *American Naturalist*, Vol. XIV, September 1911, pp. 513-23.

BEE KEEPING—A POSSIBLE HELP TO COTTON GROWERS.

It has often been noticed that a large percentage of the flowers produced by any one cotton plant fail to set bolls. A study of this condition by the late Mr. Rowland M. Meade, appeared in the *Journal of Heredity*, October 1918. Although the writer's death prevented any further investigation, his preliminary notes on the subject are very suggestive, and may lead to further studies on this line. As far as information goes, it does not appear that any experiments of the kind described below have been as yet undertaken in the cotton-growing islands of the West Indies. Such experiments and their results will be well worth recording. Much of Mr. Meade's paper is reproduced below

The percentage of cotton flowers that develop into mature bolls is generally low. Even under the most favourable conditions many of the buds do not reach the blooming stage, and many flowers that open fail to set bolls.

Inadequate pollination may be considered as a possible cause of the shedding, when the flowering stage had been reached.

The cotton flower is a large, cup-shaped blossom; it is borne in an upright position on the upper side of the fruiting branch. The pollen grains are very large, and have moist spinose surfaces, so that they tend to cohere when freed from the anthers and are not carried about by the wind.

The period during which fertilization is possible lasts only a few hours. The flowers open soon after sunrise, commence to wither as the temperature rises in the middle of the day, and closes in the evening when the stigma is dry. The second or third day after blooming, the petals, stamens, and pistil separate from the rest of the flower, and fall from the plant.

In some types the relative position of the stigmas and stamens is favourable, and in others unfavourable, for self-pollination.

Most of the flowers with long stigmas projecting above the stamens do not become completely self-fertilized, as the anthers and stigmas are too widely separated. The flowers of many of the long staple varieties are of this type, the stigmas often exceeding the anthers by 15 mm. The bolls resulting from such flowers have 23 to 45 per cent. of aborted seeds, and it seems not unreasonable to attribute this abortion in part to the lack of perfect pollination. Flowers with short stigmas inbedded among the upper stamens, are readily self-fertilized. Erect stamens, either long or short, are also favourable to self-fertilization, since they bring the anthers in close proximity to the pistils.

Cotton bolls have three to five locks or compartments, each containing from six to eleven ovules, the number varying with the type of cotton. Few locks of long staple types contain more than nine seeds, while most of those of big-bolled, short types have at least eight seeds.

It was found by preliminary investigation that the bolls failed to set unless at least 25 grains of pollen were applied to the stigmas; even with this number, only one or two seeds matured in each lock. As each lock contains from six to eleven ovules, it is necessary for at least 25 to 55 grains of pollen to reach the stigmas in order that all the ovules of a four or five-locked boll be fertilized.

An experiment was conducted at San Antonio, Texas during 1913, to determine whether an increase in boll production might be expected on the result of complete pollination. Two varieties of cotton were chosen for this investigation—Durango, a long staple type with stigmas exserted beyond the stamens, and Acala, a short staple type with short stigmas embedded among the stamens. The separation of the anthers from the stigma in the Durango flower reduces the chances of self-fertilization, while the conditions found in Acala cotton favour self-fertilization. Two rows of each variety were planted for this experiment.

One of the rows of each variety was designated as A, and the other as B. The flowers in the A rows were completely self-pollinated, anthers being removed by hand, and the pollen scattered over the pistil until the stigmas were well covered. The flowers in the B rows were allowed to become pollinated naturally.

The hand pollination in the A rows produced the effect that might be expected from the work of bees or other pollinating insects operating in great numbers.

As was anticipated, better results (an increase of nearly 11 per cent.) were obtained by artificial pollination in the Durango cotton than in the Acala variety, in which the increase was only about half as great. As before stated, the flowers of the former have exserted pistils, not adapted for perfect self-pollination, while those of the latter variety have short pistils.

No effort was made to exclude insects, and the weather conditions during the course of the investigation were not unfavourable to their activities. It is evident from increased yield of bolls secured in the long-pistilled Durango variety through artificial pollination that the presence of additional pollinating insects would aid in reducing the high percentage of shedding. The value of honey bees in this connexion is recognized in some localities, and it would seem that growers of long-stapled varieties might find bee keeping a distinct advantage to the cotton crop.

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended November 23, 1918, is as follows:—

ISLANDS. The market has remained dull, with no demand. The Factors are more desirous of selling, as the stock is accumulating, but continue to hold nominally at prices last quoted (Fine to Fully Fine 72c., f.o.b. and freight), being unwilling to make any concession in price, until there is some renewal of demand. However, we think, with order in hand, enabling us to make a positive bid, we could buy at a decided concession from present asking prices. Under these conditions, we omit quotations.

GEORGIAS AND FLORIDAS. With very limited demand the market in Savannah and throughout the interior towns is very dull. Some sales of small lots are made at irregular prices, depending upon the views or necessities of the owners, rendering it impossible to quote, as the demand is not sufficient to establish a market.

The very small amount ginned to November 15 has caused crop estimates to be reduced, and encourages the large holders of cotton to think that the limited supply will be required by the trade, and consequently a demand will spring up, enabling them sooner or later to sell to better advantage.

We can buy occasionally in a limited way:—

Fancy	64c., f.o.b. and freight.
Extra Choice	63c., f.o.b. and freight.

The exports from Savannah for the week have been : to Northern Mills 469 bales, and from Jacksonville to Northern Mills 220 bales.

The United States Census Bureau reports the amount of cotton ginned to November 15, as follows:—

South Carolina	2,132 bales	}				
Georgia	13,904 ,,	} making a total of 24,145 bales				
Florida	8,109 ,,	}				
against last year	68,188 ,,	total crop	88,174	bales		
,, 1916	93,004 ,,	,,	113,109	,,		
,, 1915	69,477 ,,	,,	85,278	,,		
,, 1914	53,875 ,,	,,	78,857	,,		

FURTHER DEVELOPMENT IN REGARD TO BRITISH COTTON GROWING.

The following information has been forwarded by the British Cotton Growing Association:—

The Council of the British Cotton Growing Association have recently had an interview with Sir Henry Birchenough, K.C.M.G., the Chairman of the Empire Cotton Growing Committee

Sir Frank Forbes Adam, Bart., C.I.E., presided, and congratulated Sir Henry Birchenough on the great work he had done for the Empire in his capacity as Chairman of numerous Committees set up by the Government. The British Cotton Growing Association early in 1917 had come to the conclusion that the development of cotton cultivation within the British Empire was not receiving the attention and assistance which it merited from the Government, and that there was a good deal of indifference being shown, which was injurious to the work the Association have at heart. It was therefore decided to send a Deputation, which was received by the President of the Board of Trade, on behalf of the Prime Minister. The outcome of that meeting was the appointment of a powerful Committee, under the name of the Empire Cotton Growing Committee, of which Sir Henry Birchenough is Chairman, to investigate the whole of the circumstances of the growth of cotton in the British Empire, and to report. The British Cotton Growing Association had during the past fifteen years effected a great deal of arduous spade work which had been done uncommonly well. Lancashire, both employers and operatives, had subscribed liberally to the funds of the Association, and nearly half a million of money had been raised without any expectation on the part of the subscribers of obtaining any return beyond extending the area of cotton cultivation. Any profits that might have been earned would have been spent in new developments.

Sir Henry Birchenough explained that the Empire Cotton Growing Committee was formed largely at the request of the British Cotton Growing Association, supported by a strong recommendation of the Board of Trade. The object of that Committee was in no sense whatever to replace anything that had been done, or was being done, or will be done in the future in Lancashire, but, on the contrary, its object was to supplement and support those efforts, and the Committee is not intended to replace any efforts, or committees, or bodies which are already at work. Sir Henry recognized most gratefully the extraordinary work which the British Cotton Growing Association had done under circumstances of great difficulty. The early years were the difficult ones, but, when once the preliminary difficulties had been overcome, the reward came much more rapidly than seemed possible in the early stages. The Empire Cotton Growing Committee was composed of representatives of the self-governing Dominions and various Colonies, of the representatives on Public Departments, and of representatives of the various branches of the cotton industry. The Committee had been in existence almost a year, and during that time there had been certain pressing problems to advise upon. The war had made progress in many directions difficult, but the Committee had now reached a stage at which they felt they could go ahead. The Committee was being further strengthened, in order to obtain the co-operation of all classes in Lancashire—a co-operation not only of interests, but of knowledge. Up to the present time sub-Committees have been set up, to divide the work among them on one hand, and on the other hand, to secure still further the cordial co-operation of the different classes in Lancashire. The Committees already appointed were Finance, Commerce, Research, Information, and three Territorial Committees, viz. India, Egypt and the Sudan, and the self-governing Dominions and Colonies. It was not desired that the Committee should be regarded as a London one; certain meetings could most conveniently be held in London, but a large number of the Committee meetings would be held in Manchester or elsewhere in Lancashire, because it was necessary for Lancashire to feel that they were their Committees, and that this was their work: and its association should be as close as possible to the industry itself. A combination of private enterprise and government assistance was vital to the future. The main Committee of the Empire Cotton Growing Committee, which of course is interested in cotton-growing all over the world, even in the self-governing Colonies and India, could take over a great

deal of the difficult work which the Association had done in the past, namely its relations with Government Departments, Colonial Governments, the Egyptian and Indian Governments. This would leave the Association freer to carry on the work of the active production of cotton. The desire and effort of the Empire Cotton Growing Committee would be to assist the Association in every way, to give advice where possible, and to represent the Association's wishes, wants, and needs to the Government. Under these circumstances it is hoped that as soon as the troubles and difficulties of the war are over, the Association will be able to take a fresh leap forward, and attain the era of prosperity which all desired. It was absolutely necessary to develop the cotton growing areas in the British Empire, in view of the large increase of American takings, and there was now an atmosphere at Whitehall most favourable to that position. The present attitude of the Government was very sympathetic. The Committee wished to feel that it had the united support of Lancashire behind it; and if so, real progress would be made.

Mr. Hutton also spoke, and stated that it was for their Association to see that the Committee was a success. It was necessary for capital, labour, and everybody to pull together in this matter, because sooner or later there would not be enough cotton to go round.

Acreage under Cotton in St. Vincent.—From a report of the Agricultural Superintendent, St. Vincent, recently forwarded for the information of the Imperial Commissioner of Agriculture for the West Indies, it appears that for the 1918-19 crop there is a total area of 6,089 acres under cotton in that island and its dependent Grenadines. Of this total there are 4,583 acres planted in Sea Island and 1,446 acres in the Marie Galante variety, all of the latter being in the Grenadines.

There has been an increase of 1,024 acres under Sea Island, or nearly 30 per cent. over the area planted last year. The acreage under Marie Galante also shows an increase of nearly 15 per cent.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. The Agricultural Superintendent writes to say there is little of interest to report for the month of November. Cotton picking was in full swing. Heavy rains at the beginning of the month, following similar rains at the end of October, led to damage being done to bolls by external disease, and consequently, some loss of crop. The rainfall was not well distributed, although the monthly total is satisfactory, namely 8·78 inches, recorded at the Botanic Station, and 8·91 at the Experiment Station.

In the report of special work of officers for the month, mention is made of visits by the Agricultural Superintendent to estates in the Calliaqua and other districts, in connexion with cotton investigations, where there was some loss of cotton due to the causes stated above. On the Land Settlement estates in the Linley Valley district, cotton is extensively grown, but the diminutive size of the plants in the majority of cases points to a deficiency in soil fertility as the cause of the poor yield. Arrowroot was being reaped and yielding fair returns. Cotton picking was also in progress at the Clare Valley-Questelles Land Settlement, and very good returns were being obtained in some cases. Here a certain amount of loss had been caused by phytophthora disease of the bolls, which, it is shown, can be minimized by giving more attention to cultural methods.

AGRICULTURE IN BARBADOS.

This is the third December in succession during which weather of an unusual character has prevailed. In December 1916 there was a protracted drought. Last year up to the 22nd day of the month there had been practically only one showery day, but on the 23rd, 24th, and 25th some parts of the island were visited by rainstorms of a severe character. Again this year, December has not brought the frequent showers which are usual at this time. But while there has not been in general sufficient rain, the weather has been cool, and nearly every day since the 9th instant there have been misty skies with only snatches of bright sunshine. Under these circumstances evaporation has not been rapid, and vegetation has not suffered as it did during the corresponding periods of 1916 and 1917.

The following shows the rainfall during 1916, 1917, and 1918 on two estates—one in the red soil on the hills almost in the centre of the island, and the other in the black soil in the south:—

Red soil	1916.	1917.	1918.
	93·80 inches	85·17 inches	76·37 inches
Block soil	1916.	1917.	1018.
	56·04 inches	51·29 inches	57·01 inches

On the whole, 1918 has been a seasonable year, and the crops now nearly matured will compare favourably with some of the best years in the agricultural history of the island.

Neither the tillage for the young crop nor the manuring has been completed, and apparently a few weeks of the New Year will have gone by before either will have been accomplished. The fields that have been put out of hand look fairly well, but in many instances the cultivation has not struck us as being up to last year's standard. There is a roughness which meets the eye sometimes, but doubtless the best has been done with the labour which was available. Many estates gave bonuses at Christmas time by way of encouragement to labourers.

We are told that the spring of young canes is in general better than it was last year. The fields planted early are growing splendidly, and the recent showers will greatly assist those which were planted at a later date.

No less than thirty-three estates changed hands during the year. The total acreage of the thirty-three was 9,132 acres, and the total sum paid for them was £808,994.

The year 1918 will, we think, be remembered as the high water-mark of prices paid for sugar estates in Barbados. Not only has the flourishing condition of the sugar market induced higher prices, but there has been keen competition among owners of factories to secure estates whereby they will be guaranteed a fairly adequate supply of canes. Time will show whether the factory system under such circumstances will or will not be the best thing for the island.

The prices of provisions, while not as low as housekeepers would like cannot be said to be exorbitant. The rates this week are: eddoes, white and nut, $1·20 per 100 lb.; yams $1·44 per 100 lb.; potatoes, 96c. per 100 lb. The bulk of the yam and eddoe crop is still to be reaped, but it is expected that potatoes will be sold at a higher rate during the early months of the New Year. (The Barbados *Agricultural Reporter*, December 28, 1918.)

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

Co-operation among agricultural workers, especially those engaged in scientific work, is the subject of the editorial in this issue.

Under Insect Notes on page 10 will be found the first part of a summary of the report of the Government Entomologist in Jamaica for the year 1917-18. On page 11 there appears an interesting note on cockroach control, together with two short notes on other insect pests.

A summary of the information during 1918, under the heading Plant Diseases, in this Journal, is given on page 14.

The article on page 3, 'Cane *versus* Beet Sugar' is of importance

The Root System of Maize.

The root system of any plant ought to be borne in mind under cultivation, for it is evident that, according to whether the roots penetrate deep into the subsoil or whether they are chiefly within a few inches of the surface, cultural operations ought to be modified to suit the habit of the plant. Interesting observations on the root system of maize or Indian corn, by H. Wenholz, Inspector of Agriculture, are recorded by him in the *Agricultural Gazette* of New South Wales, October 1918, with recommendations as to the cultivation of the plant, based on these observations.

It would seem that although maize roots have been found to penetrate to 4 or 5 feet in good soils, the crop is not generally a deep-rooting one. This is especially to be observed in the later stages of growth, in which the bulk of the feeding roots are situated in the surface soil.

When the plants are about 12 or 18 inches high, the roots will be about 6 inches from the surface between the rows, gradually approaching to within 3 or 4 inches of the surface, at a distance of 6 or 8 inches from the maize plants. After this, a large number of feeding roots approach to within 3 or 4 inches of the surface between the rows. The lateral spread of the roots depends on the dryness of the soil, the roots extending very quickly in a dry soil. In a dry season at Grafton, New South Wales, during the early growth, roots were found to have extended 3 feet laterally towards the adjacent row by the time the plants were 18 inches high. In a more normal season, the roots of adjacent rows 4 feet apart were found to be interlaced, when the crop was not quite 2 feet high. In a wet season the roots will not have spread so far.

From these observations, the following recommendations regarding depth of cultivation can be made:—

1. Deep cultivation should not be given close to the rows, but may be given between the rows in early growth.

2. Shallow cultivation throughout should be the rule after the plants are about 18 inches or 2 feet high.

In a wet season deeper cultivation can be given, not only because the roots do not spread so quickly, but because a little root pruning does not do so much harm.

A Useful Little Fish.

The usefulness of the 'million' (*Girardinus poeciloides*), as a destroyer of mosquito larvae, has often been noticed in articles in the *Agricultural News*. Another little fish, belonging to the same family, and useful for the same purpose, is the subject of an article by C. Raveret-Wattel in the *Bulletin de la Société Nationale d'Acclimatation de France*, December 1917, which is reviewed in the *Agricultural Gazette of Canada*, August 1918.

Gambusia affinis is described as a very small fish (the largest specimens rarely attain a length of 5 cm.) belonging to the family Cyprinodontidae, which closely resemble Cyprinidae in outward appearance, but are differentiated by several characters, notably the pres-

ence of teeth: many of them are ovoviviparous, as is the genus *Gambusia*.

The Gambusias are of no value as food, but are of great utility, as their food consists almost wholly of mosquito larvae, of which they destroy great numbers. They are among the best fish as destroyers of mosquitoes, because they live at the surface of the water (whence the name of 'top-minnows,' given to them in the United States), and they can live in water so shallow as to be uninhabitable for most other species; large numbers of this fish are often found in ponds where the mud is at times only covered by 3 cm. of water.

These fish breed easily, on account of their hardiness, and because of the fact that, as they are born in an advanced state of development, they are less exposed to various dangers. Experiments made in New Jersey have shown that not only are they easy to breed, but they constitute a hitherto neglected means for controlling mosquitoes, wherever the water is sufficiently warm.

It would seem as if this fish might be useful in destroying mosquito larvae in situations where *Girardinus poeciloides* would not thrive.

St. Vincent Cotton.

It is interesting to find from information supplied to the Imperial Commissoner of Agriculture by Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, that the cotton, grown from seed supplied by the Agricultural Department to various estates in St. Vincent and the Grenadines for the 1917-18 crop, was uniformly satifactory in grade. It was graded in the United Kingdom from 'Good Ordinary' to 'Superfine', and fetched prices ranging from 3*s.* 4*d.* to 4*s.* 2*d.* per lb.

The seed was from a pedigree selection of the 'Rivers' or V.1 type, originally selected at the Experiment Station, and subsequently grown at Glen and Rathomill estates, and on the small island of Battowia lying south-east of St. Vincent.

For the 1917-18 crop 11,423 lb. of this selected seed were sold to planters, with the result stated above. For the present season, 1918-19, there has been sold 14,535 lb. of the same seed. This crop is now being reaped, and is of a high standard.

The foreman of the Experiment Station, after a visit to Battowia on December 9, for the purpose of ascertaining whether the cotton was up to the required standard, and whether the crop would be sufficient to provide a large quantity of seed for the season 1919-20, reported that on the 37 acres under the selected cotton the plants were all Sea Island, and true in every particular to the type required. They were also vigorous, and bearing heavily. The seeds were large and well developed, tufted at both ends, and the lint was above the average of 'Good Ordinary' as regards length and strength.

This satisfactory condition is another proof of the advantages, even of the necessity, of continuous selection, always urged by the Imperial Department of Agriculture, if Sea Island cotton is to be a successful crop.

It is worth noting that 'Good Ordinary' and 'Superfine' are different types of cotton, used for different purposes, the quantity in demand of the latter being quite small, for very special kinds of fabrics.

Gacia Plants from Teneriffe.

In the *Agricultural News*, July 13, 1918, attention was drawn to certain flowering leguminous shrubs of the genus Cytisus, natives of Teneriffe, with a suggestion that they might be experimented with in the West Indies. Dr. G. V. Perez has recently forwarded a small parcel of seeds to the Imperial Commissioner of Agriculture, for distribution in some of these islands. Dr. Perez says that he only happens to have on hand, at present, seeds of the Gacia (*Cytisus stenopetalus*), although there may be among them a small mixture of the seeds of Gacia blanca (*C. pallidus*). The two are easily distinguished, even when quite small, the latter having very silky leaves with practically no petiole. Both are showy ornamental shrubs, and are both used as forage in the island of Palma.

The seeds, which are quite small, should be dipped, Dr. Perez says, for about half a minute in boiling water before sowing.

The Gacias are both literally covered with yellow flowers in spring and summer in Teneriffe. They grow, if left alone, into tall shrubs up to from 15 to 25 feet high. If grown for forage, they should be pollarded regularly from the time they are one or two years old.

Farm Tractors in America.

The great increase in the numbers of farm motors and in the use of them in the United States is the subject of an interesting article in *The Field*, November 30, 1918. The fact is that the farm tractor is an important agent for increased food production, and is a positive factor in the world's food problem.

Many tractors operated by a single person are accomplishing more than it would be possible to accomplish with ten horses and two men. Tractors have been so simplified in control that women are operating them with the greatest ease.

One of the most important factors in the value of the tractor is that it can be operated for twenty hours a day, thereby enabling the farmer to cultivate his farm at the time when it is best to do so in order to produce good crops.

On one large Western farm one tractor worked continuously, without stopping the engine, for eighty consecutive hours, and ploughed approximately one acre per hour during that period. While this was being done the weather was so hot that those farmers relying on the horse were compelled to stop work for several hours in the hottest portion of the day.

A few years ago the thought of tractor makers producing tens of thousands of tractors in one year was inconceivable. To-day there are over half-a-dozen firms who have this year produced over 10,000 tractors, and some of them have produced double and nearly triple this number.

INSECT NOTES.

ENTOMOLOGY IN JAMAICA.

The Annual Report on the Department of Agriculture, Jamaica, for the year ended March 31, 1918, contains among other matters the Annual Report of Mr. A. H. Ritchie, B. A., Entomologist, as Section VIII. The body of the general report was reviewed in the previous number of the *Agricultural News*. The following is a summary of the section devoted to the report of the Entomologist.

During the year the complaints of the depredation of the sweet potato weevil (*Cylas formicarius*) have been more numerous than usual. This increased prevalence appears to be due to the lack of care in selecting material for planting. Small potato roots, used to form a nursery to provide slips for planting, furnish sound plants. Young tips of vines are much more free from infestation than old and hard portions of the vine, and they also give a better yield in the subsequent crop

There seems to be no care or judgment used in this matter on the part of many; old and even infested vines were seen used for planting.

A strict rotation of crops should be practised, and greater care is necessary in the disposal of weevil-infested potatoes when the crop is harvested. It is often found impossible to allow the crop to mature fully on account of the rapid increase of weevil injury as the crop is ripening. This is estimated to be greater than the increase in weight of roots in the same time, and consequently the crop should be lifted as soon as the weevil attack is observed.

It is judged that a useful line of experiment would be that of endeavouring to produce a short crop variety—one which would ripen early with fair yields, especially for use in districts where the wet season is short, and the dry season imposes a check on the plant.

In localities where the sweet potato weevil is a pest, sweet potatoes can be expected to give crops, (a) if the natural or cultural conditions are such that the crop makes steady growth, without checks or set-backs; (b) if careful selection is made of plant material to provide the best slips and those free from weevil infestation; (c) if careful attention is given to the general sanitation of the fields; and (d) if rotation of crops is practised year after year.

The Entomologist refers to the new weevil of sweet potatoes, *Palaeopus costicollis*, and that of the yam, *Palaeopus dioscoreae*, mentioned in the *Agricultural News* (Vol. XVII, p. 346), and adds another to the list of sweet potato pests. *Euscepes porcellus*, which had not been previously recorded in Jamaica.

Other sweet potato insects mentioned are a scolytid beetle, *Hypothenemus ritchiei*, a new species found to be injurious to dried potato chips which were prepared for the manufacture of sweet potato flour; the sweet potato leaf-folder (*Pilocrocis tripunctata*, Fab.), which is occasionally destructive in sweet potato fields in Jamaica; and *Metriona propinqua*, one of the tortoise shell beetles, which occurs in small numbers.

The yam scale (*Aspidiotus hartii*) is recorded as sometimes killing out the yam plants. Badly infested roots used for planting are the source of scales which attack the young vine. The remedy is to dip the yam heads before planting in strong lime-sulphur, 1 gallon concentrate (32° Beaume) to 10 gallons of water, and allowing this to dry thoroughly. Infested vines should be burned after the crop is harvested. The yam weevil (*Palaeopus dioscoreae*) has been mentioned.

Attention is called to the prohibition by the United States Government of the importation of yams and sweet potatoes grown in Jamaica, owing to the prevalence of the weevils *Cylas formicarius* and *Euscepes batatae*.

The greatly increased production of field peas has been accompanied by extensive losses from the attack of the weevils *Bruchus phaseoli*, and *B. quadrimaculatus* in the fields and in storage.

Peas should be planted at such a time as will provide a quick growing season, and a dry ripening period. The crop should be gathered at once when it is ripe, and the beans treated immediately to destroy the weevil life in them.

This may be done by sun drying, in a machine for the application of artificial heat, or by the use of carbon bisulphide. The peas should then be stored in tight bins or other receptacles to prevent reinfestation. A kerosene tin full of peas may be successfully treated by introducing a teaspoonful of carbon bisulphide, covering down, and allowing it to remain for twenty-four hours.

'There is no method of field treatment, and control rests in proper and immediate care of the crop.'

Cut worms were much in evidence, especially in reclaimed land hastily prepared for food crops or sugar-cane. Such lands should be thoroughly cleared of all weeds and bushes, and either fallowed for four to six weeks before planting, or given an application of poison bait.

Indian corn was attacked by the usual pests, the boll worm (*Heliothis obsoleta*), and the corn ear worm (*Laphygma frugiperda*). The following are given as protections for the young plants: (a) mix a little over $\frac{1}{2}$ teaspoonful of Paris green in 1 quart of corn meal till all has a green tinge; sprinkle a pinch of this in each uncurling corn heart; (b) dust arsenate of lead and wood-ashes in equal parts, or Paris green, road dust, white-lime, or wood-ashes, 15 parts, lightly from a fine muslin bag into the corn heart; (c) arsenate of lead as a wet spray, $\frac{1}{4}$ lb. to 4 gallons of water, can be applied with force into the corn hearts from a tin mist sprayer with a quart container; (d) hand picking has given good results; (e) ground cultivation with a scuffle hoe will expose the pupating forms to sun and natural enemies the caterpillar changes into the moth in the soil at the base of the corn plant; (f) a well prepared and rich seed bed will greatly favour the quick establishment of the plants, and take them beyond the point when the worms may eat out the growing tip of the corn plant.

Corn weevil causes some loss, but this can be largely prevented by quick and thorough drying on the cob when the crop is gathered. Shelled corn should be stored in tight bins, as in the case of peas. The application of heat, and the use of carbon bisulphide have the same beneficial effect in the case of corn as with peas.

The cultivation of rice in the Westmoreland district, as a war measure, directed attention to certain insect problems connected with health and sanitation. 'Satisfactory drainage and water control in districts where rice is being grown, besides ameliorating the malaria and mosquito situation, would greatly assist in the control of liverfluke of cattle, and certain Tabanidae or horse flies. The water snails concerned as intermediate hosts of fluke would be deprived of considerable areas offering breeding conditions—conditions which are also suitable for the maggots of horse flies which at times become a plague in the region of the morass.'

(*To be continued.*)

COCKROACH CONTROL.

Experiments on cockroach control by E. V. Walter Ames, Iowa, are recorded in the *Journal of Economic Entomology*, for October 1918, Vol. XI, p. 424.

The cockroaches used in the experiment were *Blatta germanica* and *B. orientalis*.

Powdered boric acid and powdered borax and sugar were used as insecticides, and trials were made of traps.

The results obtained in these experiments are given in the summary of the article, which is reproduced herewith:—

1. Traps may be used as a means of control, but cannot be relied on as a method of extermination.

2. Boric acid is a safe and economical material to use against the cockroaches, as it is non-poisonous to human beings, and yet very effective against cockroaches.

3. A mixture of equal parts of powdered borax and powdered sugar ground together is effective against cockroaches, is safe and economical, although acting slower than boric acid.

4. Cockroaches eat these substances in an effort to keep clean, and not for any possible food value.

The large cockroach which is more frequently a household pest in the West Indies may be controlled by the same means—the use of boric acid. This is freely scattered in places frequented by the cockroaches, and as they move about in search of food the boric acid adheres to their legs, bodies and antennae and in cleaning it off with their mouth-parts, they eat enough to cause their death.

A cockroach covered with dust or dirt will, when unmolested, again begin a process of cleaning. Usually it draws first one antenna after the other slowly between the mandibles, then begins on the legs, later the abdomen, doubling up almost into a ball until it cleans itself thoroughly. Boric acid, being a very fine, light powder, readily adheres to the insect's legs and body, and must be cleaned off. The powdered borax and sugar mixture is heavier, and readily hardens if moisture is present, so is not so well distributed upon the parts of the insect's body. Hence the greater efficiency of boric acid as compared with the borax and sugar mixture.

CLYTUS DEVASTATOR, NEW PEST OF THE FLORIDA ORANGE

This is the subject of a paper by Dr. E. A. Back, United States Bureau of Entomology, in the *Journal of Economic Entomology*, Vol. XI, No 5. October 1918, p. 411.

The insect with which the paper deals is a long-horned beetle of the family Cerambicydae, the larva of which lives as a borer, attacking the healthy wood of the branches, trunks, and roots of the citrus trees. It was first described in 1836, at which time it was recorded as a serious pest of citrus in Cuba.

It has now appeared in Florida, and has demonstrated its ability to become a serious pest in that State.

It is said to have been reared from pomegranate (*Punica Granatum*), 'Cuban mahogany', and *Citrus* (orange), with the common mangrove (*Rhizophora mangle*) as its preferred host plant.

AN OUTBREAK OF FIELD CRICKETS.

The common field cricket (*Gryllus integer*) of the southern part of the Sacramento Valley, California, became so abundant in May and June 1917, as to cause severe injury to young plantings of truck crops, and especially young growths of vines and trees.

The grasshopper bait (bran and arsenic) was tried but gave little protection. Flooding the vineyard or orchard for a few hours was the most successful treatment.

The attack terminated in a complete disappearance of the cricket. (*Journal of Economic Entomology*, Vol. XI, October 1918, p. 433.)

This attack is similar to attacks by field crickets in St. Kitts and Nevis, on cotton seedlings. In these instances, a common, but usually not particularly abundant insect, developed enormously, and caused considerable injury for a short time, and then practically disappeared.

AUSTRALIAN WINES.

Apropos of the making of orange wine in the West Indies, to which attention was drawn in the *Agricultural News*, November 16, 1918, the following extract from an article in *The Times Trade Supplement*, November 1918, is of interest as showing how fermented drinks of low alcoholic standard, and of local production, may become of commercial importance, and, it may be added, of national benefit when compared with more fiery spirits:—

'Australians cannot be called a wine-drinking people, but the shortage in spirits has led to a large increase in the consumption of cheap wines. It is reasonable to assume that many persons hitherto in the habit of drinking beer or spirits will continue to consume wine, even after the conclusion of the war. Australian soldiers will also have cultivated a taste for wine after their sojourn in France, where spirits are prohibited to the ordinary soldier, and French beer is not liked. This is leading to additional areas being devoted to the growth of the vine in Australia, and later on strenuous efforts will also be made to increase the export trade. Even at the present time, when shipping is so scarce, the Australian wine grower is steadily increasing his exports to the Far East, where Australian wines are taking the place of European products. On one steamer which left Sydney during July for the East there were 1,400 cases of Australian wine. The Dutch in Java and the neighbouring islands are the largest consumers, but consignments are also going to centres to which before the war great quantities of German wine were shipped. The Chinese are also buying the choicest brands of Australian wine, one merchant alone taking 200 cases in a single order.

'The greater demand for Australian wines is revealed by official figures issued in August by the Government of South Australia, which show that last season (1917-18) the output of wine from that State was 5,322,116 gallons, being an increase of 2,371,118 gallons, or 80 per cent. on the output for the previous season. The largest preceding vintage was 3,974,838 gallons in 1913. Approximately 32,404 tons of grapes were used. The stocks of wine in South Australia on June 30, 1918 (including the latest viutage) amounted to 86,642,330 gallons. While in other States the increase in the area devoted to wine-producing grapes is not so pronounced, the indications are that Australian growers are making preparations for a big expansion in business after the war. Their anticipations should be realized, for while the Australian product does not yet equal the choicest vintages of France, it is of extremely good quality.'

The first colonists in the West Indies used to make, according to Hughes, most palatable wines from bananas and pine-apples. It may be worth while to reproduce his instructions for their manufacture in a future number of this Journal.

GLEANINGS.

A Government notice, published in the *St. Croix Avis*, November 23, 1918, proclaims that the Government of St. Croix has established stations for the free distribution of milk to mothers who have children one year old or younger, and who are unable to buy it for themselves.

From a notice in *Nature*, December 5, 1918, of the Fifth Indian Science Congress, it is reported that the statement was made at the Congress that, as one of the results of the war, several distilleries for the extraction of essential oils have been established in Southern India, and that experts now have confidence in the ability of India to supply the world's demand for sandal oil and thymol.

A practical banana grower, C. E. B. Welsh, writes in the *Agricultural Gazette* of New South Wales, October 1918, as to the actual return from an 8-acre banana plantation for the last twelve months. The number of cases despatched to the Sydney and Melbourne markets was 1,413, and the gross returns were £848 5*s*. 8*d*. After the payment of expenses, the actual net proceeds were £593 1*s*. 10*d*.

A correspondent of the *Commercial Review* of British Guiana, September 1918, referring to the manufacture of orange wine in the West Indian colonies, claims that this product is on a fair level, both in taste and bouquet, with ordinary Madeira or French wine of a smilar age; in colour it approaches that of a sherry, but it is stated that it can be made to assume a rich, deep port colour, without the use of injurious chemicals.

The pastoral industry in Brazil has received careful attention during the last two decades, large consignments of Zebu cattle from India and of the best English breeds having been imported, with a view to improving the native races of cattle. The results have been an enormous development of the export to allied countries of frozen meat since the commencement of the war (*Monthly Journal* of the Liverpool Incorporated Chamber of Commerce, October 1918.)

At a recent meeting of the Académie des Sciences, Paris, samples were exhibited of every kind of paper, from cigarette paper to card-board, obtained by the Karen Bramson process, which consists in grinding up and soaking the dead leaves of trees. It is stated that the leaves of all trees can be used for this purpose. The veins of the leaves yield a paste from which the paper is made, while the leaf powder is said to be suitable for a cattle food, or for burning. (*Weekly Bulletin*, Department of Trade and Commerce, Canada, November 18, 1918.)

The Field, December 14, 1918, in an article on the possibilities of alcohol fuel for motors, says that if on a map of South Africa, 25 feet square one square inch be marked off, enough maize could be grown on that comparatively small area to produce more than ten times the present consumption of motor spirit in the United Kingdom. That seems an astounding statement, but it shows how feasible is the production of alcohol on a large scale. Alcohol can be used in ordinary motor car engines by being mixed with 25 to 30 per cent of benzol.

The sugar crop of Peru of 1916-17 is estimated at 280,000 short tons, whereas the average annual production in the three years before the war was 185,000 short tons. Of the half-million acres of good sugar land in Peru, it is stated that only about 100,000 acres are planted in sugar-cane, but that there are projects now under consideration to increase the acreage very considerably. It may be inferred, therefore, that this industry in the Peruvian Republic has very great possibilities before it in the way of sugar production. (The *Louisiana Planter*, November 9, 1918.)

Experiments in France on the feeding of poultry with sea-weed are noted in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, September 1918. The sea-weeds were freed from salt by being washed several times in fresh water. They were then chopped into small pieces, which is easier if they have previously been partially dried. They are then mixed with boiled crushed potatoes, and put in a baker's oven for three hours, or cooked over a slow fire. When the whole is well jellied, it is kneaded, and distributed to the poultry. The hens developed well, laid normally, and their flesh had no peculiar flavour. The results are stated to have been satisfactory in every particular.

The salt industry of Turks and Caicos Islands constitutes by far the largest portion of their exports. The value of the salt exported in 1917, according to *The Board of Trade Journal*, November 14, 1918, was £31,738. The year 1917, it is stated, will ever be memorable in the annals of the salt industry in those islands, as a year when the demand exceeded the supply, and when the selling price reached a figure unknown for very many years. Especially welcome, as a result of Government effort, was the re-appearance of Newfoundland as a purchaser, after an absence of about twenty-two years. It is hoped that every effort will be made to retain this market, which is able to absorb more than one-half of the entire salt output of the Dependency.

In 1917 there were reported 136 military, 19 naval, and 23 civilian cases of malaria contracted in England, i.e. in people who had not been out of the country. The problem of the possible danger to the civilian population of the influx of malaria-infected soldiers from abroad was considered by the Local Government Board. It would appear, from the information collected, that malaria had not completely died out in England, as was generally thought to be the case, perhaps with very rare exceptions, but, on the other hand, the cases in 1917 were a new phenomenon, and there can be no reasonable doubt that the cause of these cases was the new supply of infection from soldiers from overseas, distributed by indigenous anophelines. (*Nature*, December 5, 1918.)

CATTLE RAISING IN BRITISH GUIANA.

Mr. John Mullin, of the Department of Lands and Mines, has recently pointed out in the *Journal of the Board of Agriculture*, British Guiana, July 1918, the great possibilities open to that colony to become a great meat-producing centre. His article was reproduced in the *Commercial Review* of the Georgetown Chamber of Commerce, October 1918, from which the following extracts are taken.

British Guiana possesses some 3 or 4 million acres of pasture land (known locally as 'Savannah Country') immediately adjoining the northern pasture lands of Brazil and extending northwards and eastwards to the middle West of the colony, and thence, with the exception of a forest belt (through which a cattle trail is now under construction) along the great Berbice-Demerara River divide to the Atlantic seaboard.

The following extract from the Annual Report of the Department of Lands and Mines for the year 1916, is interesting :–

'The demand for Crown lands for the purpose of grazing cattle is steadily increasing. It has, of course, been long known and thoroughly proved that British Guiana is eminently suited to the raising of cattle; but until comparatively recent years there has been no attempt to go in for systematic ranching, the reason being that practically every manager of a sugar estate possessed a fine herd of cattle which grazed on the abandoned or fallow lands of the estate, and these herds provided ample supplies to meet local demands. With the growth of the rice industry, however, lands hitherto available for grazing have been taken up for rice, and most of these herds have been broken up, and purchased by small farmers —principally East Indians—who go in more for dairy business than for the raising of cattle for slaughter. This has naturally tended to create a shortage of beef cattle, which has been reflected in the increased prices of meat in recent years, and, following the laws of supply and demand, has led to the formation of local companies for financing and carrying on cattle ranching on modern business lines, with most encouraging results.

'Thanks to the admirable work of the Board of Agriculture, and the hearty co-operation of the sugar planters in importing and distributing thoroughbred English and American stock, there are to-day many very fine herds of cattle to be seen in different parts of the colony, and prospective ranchers need anticipate no difficulty in procuring excellent cattle, thoroughly seasoned, and well suited for the preliminary stocking of ranches.

'Whilst too much stress cannot be laid on the tremendous possibilities of the large savannahs in the hinterland of the colony for cattle raising, it should not be imagined that British Guiana cannot become a large centre for cattle rearing until those savannahs are connected to the coast by railway communication. On the contrary, there are very large areas of excellent savannah land on the lower reaches of the navigable rivers of the colony which are highly suitable for ranching purposes, and which, being accessible to direct ocean steamer communication, would permit of the erection of packing and canning factories which could compete successfully in the local and West Indian markets against the present imported meats.

'Typical examples of these areas are the large, well-drained and watered savannahs on the Berbice, Canje, Ituni, Vironje, and Abary Rivers, where hundreds of thousands of areas of Crown land still await the rancher, and it remains to be seen whether these areas are to be exploited by foreign capital and enterprise, or whether the re-awakened interest in the Imperial dominions as a field for investment after the War will lead to the establishment by British concerns of ranches and packing houses which will be formidable competitors of those at present controlling the markets in these latitudes.'

The conditions under which Crown lands in British Guiana can at present be obtained for cattle grazing are very generous. Over lands on the 'Hinterland Savannahs', extending from the Brazilian boundary to the middle West of the colony, 'Cattle Grazing Permissions' are issued, each covering a 50 square mile block (10 miles by 5 miles at a nominal annual charge of $15 (£3 2*s.* 6*d.*) This permission does not require the holder to fence the land, but carries with it the right to obtain a ninety-nine year lease, if within five years from the date of issue of the permission the holder shall have (1) a corral of not less than 2,500 square yards in area, and (2) a habitable house with a resident stockman, and (3) five hundred head of cattle, on the land covered by each permission. The ninety-nine year lease carries a slightly higher rental, which at present is fixed at $2 (8*d.* 4*s.*) for every square mile, or $\frac{1}{3}$ of a cent (one-third of one half-penny) an acre, but the Government reserves the right, in the event of railway communication being established within the colony, to raise the rent to a sum not exceeding $5 (£1 0*s.* 10*d.*) for every square mile, or a maximum of a little under $\frac{4}{5}$ of a cent. an acre. This lease is modelled on the Australian laws, and is designed to encourage, and not to restrict the rancher.

Since the report of the Department of Lands and Mines was written, the Government have commenced to open a cattle trail to connect these middle West Savannahs with those running along the Berbice-Demerara River divide to the coast.

The savannahs to the west of the forest belt, and extending to the coast, may be divided into two parts of almost equal areas: (a) those situate on the low flat alluvial coast-lands, which are exceedingly fertile, and (b) those extending from the alluvial flat lands back to the forest belt, forming undulating sandy downs, well drained and watered, but not well grassed, except in their more fertile saucer-like hollows. Though apparently not so suited to cattle ranching as the savannahs of the hinterland or the lush-grass flat lands of the coast, these undulating downs should be better suited to sheep farming than the more swampy coast lands, and as the price of mutton in the local market and in those of the neighbouring islands ranges from 36c. (1*s.* 6*d.*) a pound upwards, here is a profitable field for the successful sheep farmer in this colony.

The yearly rent charged under cattle grazing leases issued in respect of the Coastal Savannahs are somewhat higher than those charged for the hinterland; being 10c. (5*d.*) an acre. The lease also requires the holder to fence the land in places where the tract taken out adjoins other holdings, and where there exist no natural boundaries, such as wide streams, which render fencing unnecessary. Highly successful ranches have been established under these leases, and the results obtained from cattle ranching on the coast-lands are decidedly good. There are exceptional possibilities for hog farming on a large scale on the coast-lands also, as there is a huge market for pickled pork, hams, and bacon, both in the colony, the West Indian Islands, and the neighbouring colonies of Dutch and French Guiana.

British Guiana is singularly free from many of the dangerous animal diseases common to other countries, and has none which are peculiar to it. On the Hinterland Savannahs cattle disease is practically unknown, and history records no epidemic of any kind.

PLANT DISEASES.

SUMMARY OF NOTES ON FUNGI AND PLANT DISEASES IN 1918.

The following is a classified summary of the information given in this Journal under the heading Plant Diseases during the year 1918:—

SUGAR-CANE. Observations on diseases of the sugar-cane in Barbados, reproduced on page 78 from the Annual Report of the Barbados Department of Agriculture, show that *Marasmius Sacchari*, the root fungus, was by far the most troublesome disease in that island affecting the cane crop. Four other fungi causing disease in cane are also recorded. From the Annual Report of the Department of Science and Agriculture of British Guiana, 1916, which is noticed on page 222, it seems that fungoid diseases of sugar-cane are diminishing in that colony. An account of a new and serious disease of sugar-cane, known as the mottling disease, which has lately appeared in Porto Rico, is given on page 110. A short review of an important paper on sugar-cane diseases in the West Indies, which was contributed to the *West Indian Bulletin*, Vol. XVI. No. 4, will be found on page 158.

CITRUS TREES. An account of citrus scab, as affecting grape fruit and other citrus in Porto Rico, as well as of wood rot of citrus trees in that island, is given on page 62. On the same page there are some notes on the water and moisture conditions most favourable or otherwise to disease-resistance of citrus trees. How to protect citrus fruits from rots in transit is the subject of an article on page 94, and the occurrence of a disease found on citrus fruits on sale in the market is noted on page 254, while on page 142 it is noticed that orange fruit may be infected with the same fungi which cause internal boll disease of cotton, in the same manner as the cotton bolls are, namely by punctures of some plant-feeding bug. A serious disease affecting orange trees in California, and known as citrus blast, is described on page 110.

CACAO. Diseases affecting cacao in Uganda are noticed on page 30, and a description of the algal disease known as red rust of cacao, will be found on page 190.

COTTON. A summary of the record of observations made on the internal disease of cotton bolls in the West Indies, which forms the subject of papers in the *West Indian Bulletin*, Vol. XVI, No. 3, and Vol. XVII, No. 1, is to be found on page 238. Notes are given (p. 30) with regard to the diseases affecting cotton in Uganda.

COCO-NUTS. Diseases affecting coco-nut trees in Jamaica are described, on page 286, and on page 302 there is a further note on the destructive disease, coco-nut bud rot, as occurring in that island. On pages 398 and 414 will be found articles dealing with the results of a recent investigation on diseases of coco-nut trees in Grenada. A description of several moulds occurring on copra, which cause great deterioration of the product in the Philippines, is given on page 318.

OTHER CROPS. A serious disease of bananas in Grenada, where it is called 'black head', is described on page 206. Investigations into the cause of this disease seem to point to the conclusion that it is due to attacks of nematodes (eel-worms). An article on grey mould of castor beans, which has occasioned serious injury to that crop in Florida, is reprinted on page 334. A new disease of coffee plants in Surinam is the subject of a note on page 382.

Other articles in connexion with plant diseases, which were printed in last year's volume of this Journal, deal with the subject in a more general way. The dissemination of parasitic fungi (p. 14) is the subject of an article which points out the many ways in which this dissemination may occur, and urges the necessity of vigilance in guarding against importations of such foes. On page 174 there is a description of the measures which are in force in Cuba with respect to plant sanitation. The different degrees of resistance or susceptibility to disease, shown by various strains of the same species of plants, is the subject of an article on page 270. A useful scheme of classification of plant diseases with reference to the nature of the parasitism involved is outlined on page 366.

Short reviews of the accounts of plant diseases given in the report of several agricultural departments will be found on pages 30 (Uganda), 78 (Barbados), and 222 (British Guiana).

On page 46 an account is given of the possible damage done to trees by the growth of the bracket fungus (*Fomes lucidus*) on their roots or collars. Brief notes on the powdery mildew of rose bushes, and on the treatment of seed with reference to angular leaf spot, will be found on page 254.

BARBADOS: REPORT ON THE SUGAR-CANE EXPERIMENTS FOR THE SEASON 1916-18.

This is the usual joint report, recently issued by Professor J. P. d'Albuquerque, Island Professor of Chemistry and Agricultural Science; and Mr. J. R Bovell, Superintendent of Agriculture, on sugar-cane experiments conducted in Barbados during the season 1916-18 Like previous reports, this is divided into three parts: Part I analysing the rainfall, Part II dealing with manurial experiments with sugar-cane, and Part III relating to experiments with varieties of sugar-cane.

The manurial experiments were directed, as in former years, to ascertaining the effect of the application of farm-yard manure in ordinary quantity and in double the ordinary quantity; also of nitrogen, phosphate, and potash, upon the industrial yield of the sugar-cane. The results from most of the plots, which are given in tabular form, are said to be so different from those of previous years, with the exception, of the last three years, and so conflicting with those of some of the other plots as to leave no doubt but that this year a very disturbing factor was again present, which has masked the true results of the manuring. This disturbing factor is stated to be grubs of the root borer (*Diaprepes abbreviatus*) and the brown hard back (*Phytalus smithii*), which attacked the canes in the manurial plots to such an extent as to render it impossible to draw any definite conclusions from the results obtained.

As to the number of seedlings raised during the period under review, it is mentioned that, in 1916, owing to the suitable weather conditions about 15,000 seedling sugar-canes were grown. Of these, 6,363 were potted out, and

2,957 of the more vigorous were planted at Waterford in 1917. These seedlings grew well and during the reaping season of 1918, 375 were reaped and the juice analysed. Of these 121 were, from their high tonnage and rich juice, considered worthy of retention. Owing to the favourable weather conditions that prevailed during the flowering season of the sugar-canes in 1917, over 15,000 seedlings were obtained. A number of these were grown from seed obtained from Bloomsbury plantation. Of the seedlings that germinated 4 977 were potted out and a first selection of 2,724 of the more vigorous were planted in April 1918 in land rented from Waterford plantation.

Since 1898 a total of 87,698 sugar-canes have been raised from seed and potted out. Of this number 7,303 reached the second stage. Of these latter 3,066 varieties were under cultivation during the season 1916-18, and 784 variety and manurial plots were reaped and the sugar-canes therefrom analysed.

At present there appear to be three seedlings which are being tried under ordinary plantation conditions, with satisfactory results, namely, B.H.10 (12), Ba.6032, and Ba.7924. There are also four new varieties, seedlings of the B. 6450, which have been cultivated for the past three years at Dodds in comparison with the White Transparent and B. 6450. As these seedlings appear to be worthy of being tried under ordinary plantation conditions, the results obtained with them are given in tabular form so that planters may, if they think fit, cultivate them tentatively on their estates. These varieties are—B.S.F. 12(45), B.S.F. 12 (34), B.S.F 12 (27), and B.S.F. 12 (24).

In the summary of the principal results obtained in connexion with seedling and other varieties of sugar-cane, it is stated that the object which is steadily kept in view is to obtain such varieties as will be best suited to the soil and climatic conditions existing in the different districts of the island. Comparison of yields from the different varieties shows that, on the average, the seedling canes B.6450, Ba.6032, and B.H.10 (12) maintain premier position in the experimental results.

PROTECTION OF INSECT-EATING BIRDS IN ST. VINCENT.

On the recommendation of the Agricultural Superintendent, a notice was recently posted up throughout the colony of St. Vincent, in which it was notified for general information that the following insect-eating birds were fully protected by law :—

'Tick' or 'Chapman' bird (*Crotophaga ani*).
'Bequia Sweet'* or 'Barbados blackbird' (*Quiscalus fortirostris*).
'Pipiri' or 'Hawk-beater' (*Tyrannus rostratus*).
'Top-knot' or 'Flycatcher' (*Elainea martinica*).
'Blue Gaulding' (*Ardea caerulea*).

The preservation of these valuable birds is necessary, because they assist materially in controlling pests damaging local crops. For example, the first three named are known to feed on the cotton stainer (*Dysdercus delauneyi*) as well as othe rinsects, and the Blue Gaulding is a noted enemy of the destructive mole-cricket (*Gryllotalpa didactyla*).

Under the St. Vincent 'Birds and Fish Protection Ordinance' of 1901, any person who kills, wounds, or takes the eggs or nest of any protected bird, or has in his possession any such bird is liable on conviction to a fine of £5, or in default, to imprisonment for any term not exceeding three months.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The month of November opened with a general absence of interest in products of all kinds, whether considered as food or medicine. The military situation alone has possessed the public mind, but as the month advanced, and it became known that the armistice had been signed, the effect even then was one more of joy than of business. Later on however, towards the close of the month, things became somewhat more normal, though by no means settled, with the disturbing element of a general election before the nation.

GINGER, NUTMEGS, MACE, AND SARSAPARILLA.

There has been a quiet but steady demand for ginger throughout the month. At the first auction on the 7th quotations were as follows: Jamaica 165*s.* to 180*s.* per cwt., washed Cochin 160*s.*, Calicut 157*s.*, Japanese 125*s.*, and African 120*s.* At the last auction on the 28th of the month ginger was easier—at the following rates: Jamaica 150*s.* to 170*s.*, Calicut 150*s.*, washed Cochin remained at 160*s.*, and African at 120*s.* Nutmegs were in good supply at auction on the 21st of the month, when some 900 odd packages of West Indian were offered, and mostly sold at the following rates: 82's. to 132's. to the lb. 1*s.* 5*d.*, slightly defective 1*s.* 6*d.* to 10*d.*, and wormy and broken 1*s.* 1*d.* to 9*d.* A week later nutmegs were again in good supply, and were disposed of at advanced rates, 7 barrels of West Indian fetching 1*s.* 8*d.* per lb. for slightly wormy. At the same auction 15 boxes of Singapore 80's were bought in at 3*s.* 6*d.* per lb. At the spice auction on the 21st of the month 182 packages of West Indian mace were offered, but only a few were sold at the following rates: 3*s.* 4*d.* being paid for good pale, 2*s.* 10*d.* to 3*s.* 2*d.* for fair, while ordinary fetched from 2*s.* 4*d.* to 2*s.* 10*d.*, and broken 1*s.* 3*d.* to 2*s.* 2*d.* A week later good pale was to be obtained for 2*s.* 7*d.*, and broken for 1*s.* 7*d.* per lb. There has been very little done during the month in sarsaparilla in consequence, it was reported, of heavy stocks already in hand.

PIMENTO, LIME JUICE, CITRIC ACID, CASSIA FISTULA, and TAMARINDS.

Pimento has been in quiet demand throughout the month varying from 6*d.* to 7*d.* per lb. Quite at the end of the month large quantities of lime juice were exported as having arrived from the West Indies, good pale raw being quoted at 4*s.* 6*d.* per gallon. The quotations for citric acid throughout the month have been steady at 4*s.* 9*d.* to 4*s.* 10*d.* Cassia Fistula has been in steady demand throughout the month at 160*s.* per cwt. It was announced at the end of the month that large supplies of West Indian tamarinds amounting to 600 barrels were on their way for the London market.

* According to Mr. Austin H. Clarke's list of birds of St. Vincent in the *West Indian Bulletin*, Vol. V, p. 75, the 'Bequia Sweet' is *Quiscalus luminosus*, a different species from the Barbados blackbird, *Q. fortirostris*.—[Ed. *A. N.*]

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 12.

ARROWROOT—No quotations.
BALATA—Venezuelan Block, no quotations; Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 90/-; Grenada, 85/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—£46.
FRUIT—No quotations.
GINGER—Jamaica, no quotations.
HONEY—West Indian, 230/- to 232/6.
LIME JUICE—Raw, 4/-; concentrated, £30; Otto of lime (hand-pressed), no quotations.
LOGWOOD—No quotations.
MACE—No quotations.
NUTMEGS—No quotationss.
PIMENTO—6*d*.
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

Trinidad.—Messrs GORDON, GRANT & Co., December 9.

CACAO—Venezuelan, $16·75 to $17·25; Trinidad, $16·50 to $17·00.
COCO-NUT OIL—$1·51 per gallon.
COFFEE—Venezuelan, 13c. to 14c. per lb..
COPRA—$7·25 per 100 lb.
DHAL—$10·00 per bag.
ONIONS—$8·00 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $5·60 per 100 lb.
RICE—Yellow, $14·00 to $14·50; White, $9·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs GILLESPIE BROS. & Co., November, 29.

CACAO—Caracas, 16c. to 16½c.; Grenada, 15¼c. to 15¾c.; Trinidad, 16c. to 16¼c.; Jamaica, 14½c.
COCO-NUTS—Jamaica selects, $51·00; Trinidad $52·00 culls, $28·00 to $29·00 per M.
COFFEE—Jamaica, 18c. to 21c. per lb.
GINGER—18½c. to 21c. per lb.
GOAT SKINS—Importation prohibited.
GRAPE FRUIT—Jamaica, $2·50 to $3·00.
LIMES—Nominal $7·00.
MACE—$1·43 to $1·45 per lb.
NUTMEGS—30c.
ORANGES—$2·50 to $3·00.
PIMENTO—8½c. to 9c. per lb.
SUGAR—Centrifugals, 96°, 6·055c; Muscovados, 89°, 5·155c Molasses, 89°, 5·052c. all duty paid.

Barbados.—Messrs. T. S. GARRAWAY & Co., December 28.

ARROWROOT—$10·00 per 100 lb.
CACAO—$12·00 to $12·50 per 100 lb.
COCO-NUTS—$38·00 husked nuts.
HAY—No quotations.
MOLASSES—No quotations.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations.
RICE—Ballam, no quotations; Patna, no quotations; Rangoon, no quotations.
SUGAR—Dark Crystals, $5·50

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A FORTNIGHTLY REVIEW

OF THE

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	PAGE.		PAGE.
Agriculture and the Future	17	Isle of Pines, Development of	29
Agriculture in Barbados...	23	Items of Local Interest ...	22
Antigua and St. Kitts Cotton	24	Market Reports	32
Bacon and Hams, Home Curing of	27	Notes and Comments ...	24
Cotton:—		Plant Diseases:—	
Maintenance of Quality of Egyptian Cotton ...	21	Plant Diseases in Jamaica	30
Sea Island Cotton Market	21	Potash Salts in U.S. America	25
Cotton Seed Products, Comparative Toxicity of	31	Poultry in the Philippines	23
Cowpea, Notes on Inheritance in	20	Sugar-Cane, Coefficient of Maturity of	25
Department News	19	Sugar Factory, Profit-Sharing in a West Indian	19
Gleanings	28	Weed Seeds, Buried... ...	24
Grain Sorghums, The ...	29	Zebra and Its Hybrids as Domestic Animals... :	25
Insect Notes:—			
Entomology in Jamaica...	26		
Tick Destruction	27		

Agriculture and the Future.

NOWADAYS the most prominent subject in the public mind, as evidenced in periodic literature, is that of the reconstruction of life and industry after the war. The war has so upset the conditions of these that the affairs of the world have to be put into order again.

The Chairman of the Royal Society of Arts, Mr. Alan A. Campbell Swinton, F.R.S., delivered a most comprehensive and stimulating address at the meeting of the Society on November 20, 1918. His subject was Science and the Future, and it was dealt with from the standpoint of the wonderful progress that has been made in the past, with an outlook towards the still more wonderful things which may be accomplished in the future.

One is apt in thinking of the inheritance received by the present from the past, to regard the material things as of most importance. Hence the wanton destruction of the production of centuries of human labour, and the devastation of cultivated lands, which have been perpetrated by the Huns continually during the progress of the war, have raised the greatest possible indignation in the minds of the civilized world. On the other hand, it must be remembered that the greatest heritage of the present is not material construction, but the products of the mind, and the accumulation of priceless scientific knowledge. It is not too much to say, as Mr. Swinton put it, that 'all our industries, all our arts, and all our sciences have their root in the distant past. Some knowledge of importance may have been, in the crash of empires and the great social convulsions that have taken place, lost or forgotten, but comparatively not much: while owing to the invention of printing, and the consequent easy multiplication of records, this is never likely to happen again, at any rate on any considerable scale.'

The reconstruction therefore of the material products of civilization is in fact of far less importance than the knowledge of how to construct them. Here comes in the value of the continuity of investigation and research, and of the records brought down from the

past, and extending through the present to the future, which it is the province of science to maintain and improve. This store of knowledge, applicable to all industries, and one may perhaps say, more especially to agriculture, has been accumulating from before the dawn of history: it is that which has enabled mankind to advance more and more in material civilization which is less important.

Now to turn to the future. The war has demonstrated in the plainest manner that the world at present nearly lives up to its food production, with very little margin beyond. Were it not for the application of science to agriculture—in mechanical aids to cultivation, in methods of irrigation and fertilization and the like, in improved facilities of transport, and in other directions—the world could hardly support its present population: while as human beings increase still more, in the future the difficulty will be further accentuated, if conditions similar to those at present continue to prevail. Then, if once the stage be reached when the population should overtake its means of subsistence, it is difficult to believe that anything could prevent the fiercest warfare between peoples struggling in dire want for the bare necessaries of life. It is for science to prevent, if possible, such a state of affairs, by further discoveries and inventions, and their applications to production.

All industries, and not least agriculture, must become more intricate and elaborate as time goes on. Success will more and more depend on the management of specially trained individuals, together with the intelligent and hearty co-operation of the great mass of workers cheerfully submitting to the technical instructions given by such management. In agriculture to-day the old rules of thumb are obsolete in most countries, and, wherever they still exist, the sooner they go the better. The modern world has no room for unscientific and antiquated methods.

In striving after the most desirable conditions it is right that science should look for all reasonable assistance from Governments, but at the same time caution will have to be exercised in control. The Government of the United States has long set an example in this direction, and it is very satisfactory to note that the British Government is awakening to its responsibility in this matter. Whatever sums the Government of the Empire may spend in promoting the application of science to industry and agriculture, provided that the expenditure is wisely directed, will soon repay themselves many times over by the increase of prosperity which is sure to result.

One way in which Governments can vitally assist in the progress of science is by increasing the facilities for technical scientific education. Some advance in this direction is being made, but wider and wiser efforts are needed to promote a more extended interest in scientific subjects. And here individuals can give useful assistance. What is wanted is to awaken a taste, especially in the rising generation, for scientific literature: for the 'fairy tales of science' will prove, if once an interest is taken in them, much more delightful than a great deal of the literary rubbish on which so many persons waste time.

Another aspect of this question is that the pursuit of science is endless. It can never be said that anyone has got to know everything about any one subject. For instance, year by year there is additional knowledge acquired in the cultivation of all crops, and in the manufacture of their products. The beet root industry is a striking example of this, and the strides made in recent years in the cane-sugar industry is another proof of the benefit accruing to agriculture from scientific knowledge and practice.

After all, agriculture has always been, and always will be the fundamental industry of mankind. For man requires energy, and that is supplied by food, the most of which must always be furnished by the products of agriculture. In reality all our energy is supplied by the sun and it is stored up for utilization by animal existence in plant life. And yet it is computed that only about three-millionths of the solar energy which reaches the earth is stored in vegetation. Thus there is a vast field for agricultural science in the future to increse the amount of available food energy by more intensive cultivation, so as to utilize more and more of the sun's light and heat hitherto not rendered available.

It would seem that this will be one of the outstanding problems of the future—how best to employ the enormous flood of radiant solar energy which daily falls on the earth's surface. And this will be especially the task of the agriculturist. Not only will he have to provide increased food, but increased fuel, for it seems probable that the stored up fuel of coal and mineral oil is well on its way to exhaustion. But the agriculturist need not think that he will have to grow only firewood for fuel. Much more likely it is that the fuel of the future will be obtained from the crops which store up in large quantities the solar energy in the form of starch and sugar, which can be converted into alcohol for fuel purposes, as is already being done. Here it would seem that the tropics may be destined to play an increasingly prominent part in the agricul-

tural future of the world. For, as is well known, most of the root crops of the tropics are capable of producing large proportions of starch, while even the waste products of the sugar-cane factory are capable of producing quantities of alcohol.

In conclusion, with science directing the agriculture of the future, and skill, economy, and energy co-operating in its pursuit, there is no reason to fear that the reorganization of the world's agricultural resources will in any respect fall short of the result hoped for.

PROFIT-SHARING IN A WEST INDIAN SUGAR FACTORY.

In presenting the report of the Directors to the ordinary general meeting of the Ste. Madeleine Sugar Company, Ltd., held on November 21, 1918, the Chairman, Mr. G. Moody Stuart, gave an interesting sketch of some proposed developments in the future working of the company.

He first alluded to the difficulties which had been experienced in the past season in Trinidad, owing to shortage in the cane crop. This was attributed generally to the ravages of the frog-hopper. On the other hand, it appeared as if the damage had been mainly due to excessive rainfall, causing injury to the canes in many ways, especially in keeping the subsoil in a water-logged condition, conducive to root disease. The cane crops on the lands belonging to the company were much less damaged than those on some neighbouring estates, the explanation given being the good work done during the last four years to improve the condition of the land on the company's property.

The great increase in the cost of production was noted as a matter for grave concern. In spite of this and of the short crop, the Directors, owing to the present high prices for sugar, were able to declare a dividend to the shareholders.

The most interesting portion to the public, apart from shareholders, is the part of Mr. Moody Stuart's speech dealing with proposed future improvements in the transactions of the factory with three groups of employees.

The first group is that of cane farmers; that is, those who grow cane on small holdings for sale to the factories. There are 7,000 of these growing cane for the Ste. Madeleine factory.

The system in Trinidad of regulating the price of such cane has never been satisfactory. The Antigua method is the fairest, basing the cane price always on the value of sugar, and it has been decided to adopt it at Ste. Madeleine, with an adjustment to cover the difference between the quality of the cane, and conditions of delivery in Antigua and those in Trinidad. In Antigua the peasants' cane rate is 4½ per cent. on the value of sugar delivered on board ship, but the quality of the cane there is 17 per cent. better than in Trinidad, and in Antigua the factory is free from certain charges which it has to bear in Trinidad. To cover these differences, the terms at Ste. Madeleine are made 4½ per cent. on the value of the sugar delivered on board ship, less charges for export duty, shipping, bagging, and also of transport of the cane. With this adjustment the two companies will be placed on equivalent terms. The price for the past season on this basis works out at 16*s.* per ton instead of 14*s.*, which means an additional payment of £7,948 13*s.* 4*d.* distributed among the cane farmers of Ste. Madeleine this year, and it will probably mean a much bigger difference to them next year. This will assuredly lead to contentment among them, and prove an encouragement te develop the industry. It may be added that, while the Antigua cane is 17 per cent. better than the Trinidad, one can raise a 50 per cent. heavier crop per acre in Trinidad and with less labour. So the Trinidad farmers have a big advantage. With help and guidance they will be able to get much heavier crops from their land, and so become a very prosperous community.

The next group with regard to which a new departure is proposed is the staff at Ste. Madeleine.

It is proposed that they shall participate in the profits, and that their share should be calculated on the following basis. From the profits of each year there will be first deducted £1 per ton on the sugar produced, as a minimum for the shareholders, or a sum sufficient to cover the present dividend if the £1 per ton does not suffice, and that then 10 per cent. of what remains be devoted for the benefit of the staff. It is felt that in prosperous years they should share in the prosperity to which they have contributed. 'They are loyal workers,' Mr. Moody Stuart said, 'and take an interest in their work, but now we are going to ask them also to take an interest in a double sense of the word, in the profit that comes from their work. All, from those in the humblest positions to those at the top, can help to increase the profits, sometimes, by guarding against waste of time or material, sometimes by suggesting better methods, or it may be by helping in some other way, and we may be sure that by hearty co-operation and determination to watch the company's interests, the work will get better and better.'

The final group, a very large one, whose interests are being studied at Ste. Madeleine, are the labourers.

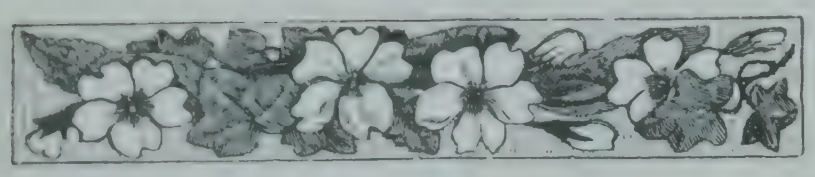
With regard to the large majority of these, employers have not had the full responsibility until recently. They were indentured coolies, and the Government laid down rules as to the pay to be given them, their housing accommodation, their hospital and medical requirements. Employers had simply to do what they were told. But the indentures have been running out, and the people, instead of returning to India, have been staying in the island as free labourers, and very soon there will be nothing but free labourers; and the responsibility of caring for their proper housing, for their health, and their interests in every way devolves on those employing them. It will involve, at least at first, some considerable expenditure in excess of what has had to be paid under the Government régime, for more must be done than has been done in the past, if their conditions of life are to be rendered such as they ought to be.

What is wanted is better housing, better provision for maintaining health, and to make the conditions of their life as good as possible—just the things that the nation at home is striving after.

DEPARTMENT NEWS.

Mr. H. A. Ballou, M. Sc., Entomologist on the staff of the Imperial Department of Agriculture, returned to Barbados on January 18, after a visit to Grenada.

Mr. G. A. Jones, Assistaut Curator and Assistant Chemist, Agricultural Department, Dominica, has resigned this post, and has accepted a position on the staff of the Ste. Madeleine Sugar Company, Trinidad.



NOTES ON INHERITANCE IN THE COWPEA.

THE COLOUR OF THE SEED COAT PATTERN.

Mr. S. C. Harland B.Sc., has furnished us with the following note in continuation of his investigations on inheritance of characters in the cowpea.

A paper by the writer, shortly to be published in the *Journal of Genetics*, contains data on the inheritance of three factors which affect the colour of the seed coat pattern. These are as follows:--

B. The factor for Black. Dominant to Red, Brown, and Maroon; also causes colour to appear in the calyx, peduncle, and tip of young pod. The New Era factor (E) also produces colour in these regions but of less intensity.

N. The factor for Brown. Dominant over Maroon, and over Red.

M. The factor for Maroon. Incompletely dominant over Red.

In a cross between Black and Brown the F_2 ratio was 3 Black to 1 Brown. The F_2 ratio of a cross between Brown and Red was 12 Brown : 3 Maroon : 1 Red, i.e. the cross was N M (Brown) by n m (Red). The F_2 types were 9 N M (Brown), 3 N m (Brown), 3 n M (Maroon), and 1 n m (Red).

The object of the experiments to be described in the present note was to learn more about the genetic constitution of the albino type Para, which has a white or cream-coloured seed.

Para by Red.

Red is recessive to all colours so far worked with, and it was thought that a cross with Para would show whether the latter contains any hidden colour factor.

The F_1 was Brown, of the same shade as the Brown type N m alluded to above. In the F_2 segregation occurred into Brown, Red, and White, thus:—

	Brown.	Red.	White.
	10	3	4
Expectation on 9:3:4 basis	9·56	3·19	4·25

The numbers obtained are close to expectation, and it is probable that the cross involves two independently inherited factors:—

R, the factor for Red.

N, the factor for Brown. N has no visible effect in absence of R.

Red is a solid type, and it also possesses anthocyanin in stem and leaf axil. Thus its constitution is probably X W H n R, while that of Para is X W H N r. It will be noted that Para is assumed to contain the anthocyanin factor X. If Para did not contain this factor, we should expect to obtain in F_2 plants with Red seeds but with no anthocyanin in the vegetative parts. Such types are known to exist, but they do not appear in this cross. If Para does contain X, the latter is another factor which cannot appear except in presence of the basal factor for pigment in the seed coat, which may now be called R

Para by Maroon Watson.

Para does not contain the Maroon factor M, for no Maroon types appear in the cross Para by Red. Thus its constitution may be re-written X W H N m r. Para was crossed with a Maroon with Watson eye, the constitution of which was X W h n M R. The F_1 should be Brown Solid. An F_1 family of twelve plants gave the expected result, but the F_2 was not grown.

Para by Black.

Two crosses were made. The F_1 was Black, and in the F_2 segregation occurred into Black, Brown, and White in the 9: 3: 4 ratio.

	Black.	Brown.	White.
Family 1	16	2	9
,, 2	26	14	9
Total	42	16	18
Expectation	42·75	14·25	19

The first cross was with a Black Solid, and from what is known of the genetic constitution of Para, it is probable that a correct representation of the factors involved is as follows: —

Black (B W H N R X) by Para (b W H N r X)

The cross being a bifactorial one, the F_2 tyyes will be:—

9 B R	: 3 B r	: 3 b R	: 1 b r
Black	White	Brown	White

Thus the factor B has no effect except in presence of R. The similarity between the results of this cross and that of the Para by New Era cross is obvious.

In the second cross, the Black parent was the variety of Black eye which lacks the Watson and Holstein factors (W and H), and is therefore presumably of constitution B w h N R X. It has previously been argued that Para is really a Solid type, but no pattern is visible on the seed coat owing to the absence of the factor R. Para has a white flower. Black eye not having the Watson factor, has a pale flower. If Para contains the factors for Solid colour, W and H, the F_1 of a cross with Black eye will be Dark-flowered, with the pattern Solid colour, and in the F_2, the following types should appear:—

Black Solid, Black Watson, Black Holstein, Black eye, Brown Solid, Brown Watson, Brown Holstein, Brown eye, and Albino. All these were recorded except Brown eye, but as this type is only expected to occur in three plants out of 256, its absence in a family of fifty plants need not occasion surprises. The results of this cross in regard to the inheritance of pattern, are as follows:—

	Solid (WH)	Watson (W h)	Holstein (wH)	Small eye (w h)
	24	8	3	1
Expectation on 9:3:3:1 basis	21·6	7·2	7·2	2·4

These results are fairly close to expectation, and confirm the suggestion that the albino type Para contains W and H, the factors for Solid colour.

SUMMARY.

In cowpeas there is a factor R which produces a Red colouration of the seed coat pattern. In the absence of this factor no pattern can appear on the seed coat, and thus the factors which have been mentioned as responsible either for the production of pattern or for variations in the colour of the seed coat pattern, are without effect in absence of R. These factors are:—

B (Black), N (Brown), M (Maroon), X (factor for anthocyanin in stem and leaf stalk), W (Watson eye), and H (Holstein pattern).

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended December 21, 1918, is as follows:—

ISLANDS. The market remains dull, with limited demand. With the stock accumulating, the Factors are more desirous of selling, but continue unwilling to make any further concession in price; consequently, we have to quote, viz:—

Fine to Fully Fine 57c., f.o.b. and freight.

There were orders in the market the early part of the week at 56c., f.o.b. and freight, but could not induce the holders to accept the price. However, with a continuance of no better demand, they may consent to sell to-day, if the bid was renewed.

GEORGIAS AND FLORIDAS. The Savannah market is dull and nominal. Some buying has been going on in the interior markets, and sales are estimated to be about 600 bales.

The buying is on account of the Northern Mills, and is on a basis of—

Extra Choice 55½c., f.o.b. and freight.
Average Extra Choice 55c., f.o.b. and freight.

The exports from Savannah for the week have been : to Northern Mills 92 bales, and from Jacksonville to Northern Mills 104 bales.

The United States Census Bureau reports the amount of Sea Island cotton ginned to November 13, as follows:—

South Carolina	4,821 bales	making a	total of	31,060 bales
Georgia	14,291 ,,			
Florida	11,948 ,,			
against last year	83,352 ,,	total crop	88,174	bales
,, 1916	110,448 ,,	,,	113,109	,,
,, 1915	83,810 ,,	,,	85,278	,,
,, 1914	71,488 ,,	,,	78,857	,,

MAINTENANCE OF QUALITY OF EGYPTIAN COTTON.

A special article on the maintenance of the quality of of Egyptian cotton, is contributed to the *Bulletin of the Imperial Institute*, Vol. XVI, No. 2, by Gerald C. Dudgeon, C.B.E., F.E.S., Consulting Agriculturist, Ministry of Agriculture, Egypt. In this it is claimed that Egyptian cotton holds its high position in the world's markets by reason of the combined qualities of fineness, strength, and length, which its staple possesses in comparison with that of cotton from other parts of the world.

The climatic and cultural conditions found in Egypt afford the country unique advantages, as far as it is at present known, with respect to the production of the particular kinds of cotton possessing the above-mentioned valuable qualities.

Attention is directed to the fact that the life of any variety of cotton in Egypt extends for a few years only, such life being determined by the length of time occupied in the variety becoming so impure that its characteristic advantages are no longer apparent. This loss of purity, which by depreciation in value has frequently rendered the position of the Egyptian cotton industry precarious, has led to the introduction from time to time of new varieties showing improved qualities in comparison with the varieties which have declined, and which they are destined to replace. These new varieties, in their turn, for want of proper control, proceed to deteriorate in the same manner, as soon as their cultivation becomes extensive. The reason for this deterioration of varieties is fully explained in the article, and will be found briefly stated in the summary appended, together with other matters of interest, which we commend to the careful consideration of cotton growers in the West Indies.

SUMMARY.

(1) Egypt has so far as at present determined, unique advantages for the production of a special kind of cotton of high value. Attempts are being made in India and Arizona to emulate Egypt's success in this respect, and attention is drawn to the progress made in America, to be regarded as a warning of what may happen if steps be not taken to maintain the purity of the existing Egyptian commercial varieties in this country.

(2) The period of life of an Egyptian commercial variety is not long, owing to the fact that the characteristic qualities which constitute its value, are usually rapidly broken down by cross-fertilization in the field, and by careless mixture of seed in the ginneries.

(3) The origin of all Egyptian commercial varieties appears to have been a single plant in each case. These plants may be assumed to have been 'mutant' strains, the nature of which, so long as they are each inbred, is to breed true to the parent type. The theory of the commercial varieties being ever-splitting hybrids is therefore apparently untenable. The assumption of the mutational origin of Egyptian commercial varieties is supported by what has been found to occur in experimental breeding from Egyptian seed in Arizona.

(4) The inducement for certain cultivators to select single and remarkable plants, in order to propagate new varieties, has arisen from a desire for money-making, but this advantage is only coincident with the retention of a monopoly of the seed. Impracticability of keeping this has resulted in the deterioration of the variety as soon as control was lost. The Government's attempts to fix and maintain the purity of existing types are faced with the same fate when the purified seed becomes widely distributed. The necessity of cultivators asking for the co-operation of the Government in prolonging the life of pure commercial types should be brought to public notice. The measures which the Government would have to enforce, if control were to be exercised in this matter, are stated.

(5) Examples are given of the introduction of locally undesirable types of cotton into areas otherwise confined to the cultivation of one special kind; and of the injurious irregularity introduced into the seed for sowing by the fraudulent admixture of two totally different varieties of cotton in the operation of ginning. A statement is made of the success which has attended the efforts of the Ministry of Agriculture in the isolation of a purified type of cotton, which has yielded from 6½ to 9½ kantars per feddan (620-906 lb. of ginned cotton per acre) in the last year, and of which samples have been pronounced by buying experts in Alexandria to be of excellent quality. Attention is drawn to the fact that, in the process of the dissemination of the seed descendant from the purified type, it must, under present circumstances, become impure, necessitating the incessant selection each year of a new nucleus, in order to overcome the establishment of the inevitably deteriorated descendants. This difficulty would disappear if the majority of cultivators, as well as the ginners, could be brought to understand the position thoroughly, and combine in an appeal to the Government to assist them.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST VINCENT. There is little to report of interest for the month of December, Mr. Sands writes to say. The reaping of arrowroot and cotton was retarded in certain districts, owing to an outbreak of influenza amongst the labourers. The weather was seasonable and the later planted cotton was bearing well. The rainfall recorded at the Botanic Station was 7·98 inches, and at the Experiment Station, 5·41 inches

A visit by Mr. W. Nowell, Mycologist on the staff of the Imperial Department, on December 17, is recorded.

GRENADA. In notes of interest for the month of November now to hand, it appears that plant distribution included the foliowing: lime plants, 2,100; coco-nut plants, 19; budded citrus, 30; grafted mangoes, 15; timber trees, 11; ornamental, 21; seed coco-nuts, 3,093; kidney beans, 131 lb.; Canadian Wonder beans, 1 lb.; Stizolobium, 2½ lb. Regarding staple crops, Mr. Moore states that the picking of cacao was continued, and the trees were flowering well again in some sections; reports were however conflicting as to the prospects of the crop as a whole. The nutmeg crop was finishing well; there had been a drop in local prices from 23c. to 8c. The lime crop was good: concentrating works will soon be needed to deal with this crop. The sugar crop looked promising where good cultivation had been given. Grinding had begun on small holdings. The prospect of the Sea Island cotton crop was doubtful: Marie Galante was promising. Cotton stainers were plentiful. The yam crop was poor in some places but good in others. Other provision crops were good. The rainfall recorded at Richmond Hill during the month was 6·54 inches.

In the month of December plant distribution comprised: coco-nut plants, 54; timber trees, 12; ornamental plants, 12; seeds, 5 packages. In the Botanic Gardens work of a routine nature was performed. In regard to staple crops, Mr. Moore says that compared with the last crop, the pickings of cacao to date are considerably less on many estates. There is promise, however, of good second pickings, if the weather continues showery enough. Cacao thrips had begun to decrease; spraying for thrips was still in progress on one or two estates. The rainfall recorded at Richmond Hill during the month was 4·35 inches.

DOMINICA. According to notes forwarded by the Curator, Mr. Joseph Jones, during the month of December the crop from the lime experiment station amounted to 190 barrels, making a total of 987 barrels of fruit for nine months. Plant distribution during the month was as follows: limes, 5,000; cacao, 50; budded citrus, 60; grafted oranges, 2; shade tree cuttings, 100; peanuts, 10 lb. In addition, 78 packets of vegetable seeds were sold. The local price for ripe limes and raw lime juice remained unchanged. There is a good demand for cured cacao. Local buyers are now paying 5*d.* to 6½*d.* per lb. for this product. The rainfall for the month was 5·86 inches. The total rainfall for the year (1918) was 71·64 inches, or 9 inches below that of the previous year, which was 80·80 inches.

MONTSERRAT. Mr. W. Robson writes to say that the rainfall during the month of December was moderately favourable for crops. The reaping of the cotton breeding plot in the Experimeut Station was completed, the total yield being at the rate of 550 lb. of lint per acre Plant distribution included: lime plants, 600; bay plants, 300; sweet potato cuttings, 400. Reapings from the bay tree experiment plot totalled 7,176 lb. of leaves, yielding 80 lb. of oil from the acre; the plot remains vigorous. The second crop of cotton in the island has turned out moderately well. In one district serious damage was done by cotton stainers. One thousand bales of the 1918 crop have been delivered to the Government. It is now questionable if the total crop will much exceed that of last season. A considerable area of land is ready for next crop, and the indications at present are that the area planted in 1919 will equal that of the present season. The date fixed for the destruction of old cotton plants is January 31, and the planting of the new crop is allowed from March 1, as in last year. No results have so far been obtained in the attempts made to destroy silk cotton trees by means of sodium arsenite. Destruction of the mahoe trees by felling was continued. The question of suggesting amendments to the Cotton Traffic Ordinance is under consideration by the Agricultural Society. The arrival on December 30, of Mr. S. C. Harland, Assistant for Cotton Research on the staff of the Imperial Department, is noted. His visit is regarded as of considerable interest in connexion with the cotton breeding work carried on in the island. The rainfall recorded at Grove Station was 5·10 inches.

The total rainfall for the year (1918) was 55·38 inches.

ANTIGUA. During the month of December plant distribution comprised the following: decorative plants, 18; cane plants, 57,455; castor seed, 50 lb. Mr. Jackson mentions the fact that attempts are again being made to raise new varieties of sugar-cane. The cane crop throughout the island made but poor growth during the month, on account of the dry weather experienced. On some fields good stands have been obtained with the newly planted crop Account sales for cotton sold to the Admiralty have been received. All Antigua cotton, with the exception of 12 bales, was graded as 'Good Ordinary', and obtained 40*d.* per lb.; 12 bales, graded as Ordinary, were sold at 36*d.* per. lb. The Barbuda cotton was graded as Ordinary and obtained 36*d.* per lb. During the early part of the month attacks of cotton caterpillars were experienced, which decreased considerably towards the end of the month. The attack of flower-bud maggot appears also to be decreasing. Cotton stainer attacks were slightly increasing. The rainfall for the month was 1·41 inches; for the year, 39·89 inches. The rainfall was practically the same as that for 1917, and the past year, Mr. Jackson thinks, may be regarded as an indifferent one from an agricultural point of view.

ST. KITTS There were distributed during the month of of December: 25 lb. rounceval peas, 3 lb. soy beans, and 6,000 cane cuttings. The cane crop throughout the island continues to improve owing to the good rains of the past month, and prospects, Mr. Shepherd states, are considerably better. Contracts are being made by many of the muscovado estates for syrup instead of sugar, and the Factory crop has already been disposed of at a high figure. The young cane crop is germinating well. The late cotton has been much affected by the heavy rains and attacks of cotton stainers, hence a smaller return is anticipated. The earlier planted cotton has given a good average return. The Ordinance providing for the destruction of the food-plants of the cotton stainer has been put into operation. The rainfall for the month was 4·70 inches; total rainfall for the year, 49·35 inches.

VIRGIN ISLANDS. According to notes forwarded by the Curator, Mr. W. C. Fishlock, little beyond routine work was attempted at the Botanic Station, Tortola, during the month of November. The general condition of the crops in the island is said to be poor. Cotton cultivations suffered from severe attacks of cotton worm; potato plots also suffered

from attacks of Protoparce. The only crop not observed to be attacked by any form of of worm was cassava. A somewhat larger amount of stained cotton coming in, appears to indicate the spread of internal boll disease. Considerable areas—perhaps three times that in recent years—have been planted in ground provision crops. The weather was very dry for the time of year. Rain fell in measurable quantity on thirteen days of the month, the total precipitation recorded at the Station being 1·58 inches, as compared with 5·34 inches, the average of the month for the preceding seventeen years.

In his December notes Mr. W. C. Fishlock writes to say that the lack of labour greatly interfered with operations at the Tortola Experiment Station during the month. Cotton cultivation both in Tortola and in Virgin Gorda had greatly improved in condition, but had received a set-back through severe attacks of cotton worms. Considerable activity was still displayed in the cultivation of ground provisions. Sweet potatoes were plentiful, but still high in price, which ranged from $3 to $3·50 per barrel. The weather during the early part of the month was very rainy. The total rainfall recorded at the Station was 14·96 inches, as compared with 7·39 inches, the average for the month for the preceding seventeen years.

AGRICULTURE IN BARBADOS.

In the hilly districts of the island there has been favourable weather for the needs of the agriculturist, while in all other districts, and particularly those adjoining the seaboard, there has been a continuation of the showerless weather which began towards the end of November.

We gather that, on the whole, the spring of the young crop has been much better than last year The fields planted early in November have grown well, and in many instances the second supplying of holes here and there in each field is being done. The fields which were planted later are springing as well as could be expected, but the supplying of them is being delayed until there have been showers to moisten the surface.

Some of the methods adopted this year in planting the young cane crop are the result of observations during the past few years of the characteristics and habits of the new seedlings. Nothing could be more helpful to the agriculturist than the tabulation of statistics and of experiments systematically carried out. From these data useful conclusions may be drawn and put into practice. It was in this manner that the wastage in sugar manufacture was recognized, and an application made of those principles which have revolutionized cane milling in every part of the globe.

With the time for reaping fast approaching, planters are making every effort to complete the tillage for the young cane crop, and the manuring of it. Green dressings, grown especially for the purpose of aiding in the manurial supply, are most desirable, but on many estates, the question of fodder hinders this. Neither improved sugar-cane varieties nor intensive cultivation can avail much, if there is a serious diminution in organic material.

The old cane crop has not suffered from the dry weather to any appreciable extent. It is more advanced than at this period last year. It is expected that a better yield than last year will be obtained. Every planter with whom we have spoken has given us an encouraging account of his crop. (The Barbados *Agricultural Reporter*, January 11, 1919.)

POULTRY IN THE PHILIPPINES.

The following from the *Philippine Agriculturist*, September 1918, is so apposite to the crude methods mostly obtaining in many of the West Indian Islands, that with the change of a few words, it might have been written for this Journal. The advice given at the end is also worth being followed by poultry raisers in these islands.

The native methods of raising poultry are usually crude, and show lack of system. Chickens are not properly housed, and they are allowed to roam around and seek their own food as best they can. Tops of houses and trees around them serve as roosts, and the fowls are constantly exposed to rains, storms, and other enemies. Very little attention is given to the proper selection of breeding fowls, with the result that no progress whatever has been made in developing high grade flocks.

One of the greatest drawbacks to the proper development of the poultry business in the Philippines is the lack of knowledge of poultry sanitation.

Very few native poultry raisers in the Philippines give proper care to their laying hens. The hens lay their eggs in nests made of bamboo baskets, which are hung at different places around the dwelling houses out of the reach of disturbing animals. The gathering of the eggs is very irregular; setting hens are allowed to remain on the same nests as the laying hens, with the result that the heat from their bodies starts the incubation of the newly laid eggs. Young chicks, just as old ones, are also improperly cared for as to feeding, diseases, and enemies. When newly hatched they are not given soft diet, but are immediately given cracked rice or corn This is their diet for a day or two, after which time they are given unground rice, or allowed to eat the same food as is given to the adult fowls. Young chicks are usually confined for a day or two after hatching, until they are strong enough to wander with their mother. Then begins the irregularity of feeding. They may or may not be given food every day. The young chicks have to depend upon whatever food they with their mother can find around the premises. Some mother hens lead their flocks far from home, and consequently only a small percentage of the brood ever reaches maturity, owing to the countless enemies which they meet. The chicks also suffer from diseases while they are still young. There is practically no attempt made to isolate the infected ones from the healthy ones.

The Philippines are naturally favourable for the development of this industry. During practically the entire year there are plenty of green feeds, one of the most important features in the production of poultry, and insects are plentiful as a source of protein food. The cost of houses is also low as compared with other countries, since they do not have to be built very solidly.

Before the poultry business is entered on there should be given due and thoughtful consideration to the following points:—

1. Proper housing and appliances that will insure the health and safety of the fowls should be provided.

2. Crude methods of care, management, and feeding should be abandoned entirely.

3. There should be a knowledge of poultry diseases and pests, and of their prevention and eradication. A lack of knowledge of this part of the business will always keep the poultry grower on the verge of failure and discouragement.

4. Pure-bred roosters should always be kept with the flock, and proper grading practised.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department. The complete list of Agents will be found on page 4 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial discusses some points of agricultural reconstruction after the war.

The article on Entomology in Jamacia, which was begun in the last issue, is concluded on page 26.

Under Plant Diseases, page 30, will be found an article dealing with plant diseases in Jamaica.

On page 19 there is an article referring to recent developments in the conduct of a West Indian sugar factory.

Antigua and St. Kitts Cotton.

In the previous number of the *Agricuttural News* attention was drawn to the high grade of Sea Island cotton produced last season in St. Vincent, as reflected by the good prices obtained in England for the lint.

Information of the like kind has been since received from Antigua and St. Kitts, showing that, as in the case of St. Vincent, most satisfactory results have been obtained owing doubtless to the careful cotton seed selection practised in those islands also.

In Antigua, Mr. T. Jackson, the Agricultural Superintendent, reports that of the 171 bales of cotton shipped to England by s.s. *Colonial*, all except twelve, were classed as 'Good Ordinary', and were sold at 40*d.* per lb. The remaining twelve were classed as 'Ordinary,' and fetched 36*d.* per lb. This was also the grade and the price obtained for 31 bales of cotton from Barbuda.

From St. Kitts, Mr. F. R. Shepherd, Agricultural Superintendent, writes that the account sales for the shipment of cotton from St. Kitts-Nevis by the same steamer were to the effect that some of the St. Kitts cotton was classed as 'Extra Fine' and 'Superfine,' and sold at 45*d.* per lb., while the cotton from Nevis fetched from 36*d.* to 40*d.* per lb. On the whole, Mr. Shepherd considers the results very satisfactory.

Buried Weed Seeds.

Problems arising from the breaking up of grassland have been under investigation at Rothamsted Experiment Station in recent years. When in 1915 it became evident that this policy had to be adopted in England, a grassfield was broken up and sown with various experimental plants. The results are recorded in the report of the Station for 1915-17.

One set of problems arises out of the weed flora. Although the field chosen for the ploughing up experiment had been down to grass for ten years, there was a considerable development of arable weeds as soon as it was ploughed. This result had been anticipated, and before the land was broken up samples of earth were taken, inch by inch in succession down to 12 inches at various points in the field. These were transferred at once to sterilized pans, and kept moist in the glasshouse, careful watch being kept by Dr. Winifred E. Brenchley to see what would happen. A number of arable weeds came up from every sample. Now the conditions of the experiment were such that these young plants could only have arisen from seeds in the soil, dormant as long as the land was in grass, but springing into activity as soon as tillage conditions were restored. The test was repeated in similar manner on other grass fields of known age and history. Soil from grass fields forty years old afforded a copious flora of arable weeds, especially at the depth of 6 to 12 inches; that from fields sixty years old gave fewer arable weeds, and from fields 200 years old none at all. These observations prove beyond doubt that the seeds of certain arable weeds can survive in the soil over a considerable period when deeply buried by the plough.

The Coefficient of Maturity Sugar-cane.

Some interesting notes of studies in what the authors term the coefficient of maturity of sugar-cane have been forwarded to this Office. The authors, Migaku Ishida and Hidezo Sawasaki, of the Government Sugar Experiment Station, Formosa, claim that by determining the ratio of sucrose to 'reducing sugar' (glucose) in the whole stem of the cane, its maturity can be determined. They divide the percentage of sucrose by the percentage of glucose, and term the result the coefficient of maturity, which indicates by its value the condition of maturity or otherwise of the cane.

This coefficient gradually increases in Formosa from August to November, and then suddenly increases, attaining apparently its maximum in February and March This increase denotes maturity, it is claimed, and the figures vary little from year to year for canes of the same variety under similar climatic and soil conditions, the variations being probably chiefly due to climatic influences.

Each variety of cane has its own coefficient of maturity, and therefore may by this be classed as an early or late ripening variety, according to the time when it exhibits the maximum.

In dry weather the temperature exerts the chief influence on maturity of the cane. A rising temperature under dry conditions is accompanied by a fall in the ratio of sucrose contained in the cane, a falling temperature causing an increase of ratio during the mature period.

This last observation seems to accord with the conditions experienced throughout the West Indies in the abnormally hot reaping season of 1915, which was reflected every where in these islands from Porto Rico to Trinidad in the low sucrose content of the canes.

Investigations in the West Indies on the lines taken by these Japanese sugar chemists would certainly be of interest, and might lead to more accurate knowledge with regard to the ripening period of the different varieties of cane, which would be of considerable value.

The Zebra and Its Hybrids as Domestic Animals.

In the *International Review of the Science and Practice of Agriculture*, September 1918, there is an interesting note on experiments in breeding zebras or zebra-mules, from which it would seem that some of the hybrids are promising animals for domestication.

Three species of zebra are recognized: *Equus zebra*, the common or mountain zebra; *E. burchelli*, and *E. grevyi*. The latter is heavier than the others, with closer and darker stripes.

The different species of zebra have all been used for crossing, and some seem better suited than others. Burchell's zebra (which was used by Professor Ewart for crossing) has been used very often: the mountain zebra, common in South Africa, has also been used. For other crosses, especially those carried out by the United States Government, Grevy's zebra was used. This latter is somewhat larger than the others, being 52 to 56 inches high; an adult animal weighs from 770 to 883 lb. It occurs in Abyssinia and Somaliland but it is gradually becoming rarer and rarer, while it is with difficulty transported from the place of capture to countries across the sea. Although it has never been domesticated, it is docile, and would probably be easy to domesticate and rear.

The hybrids obtained in the United States are very vigorous, and resist the cold of temperate regions as well as does the ass. They show a decided improvement over the parents as regards their form, movements, and way of standing.

The cross, she ass × zebra, are very obstinate and hard mouthed, which constitutes an obstacle to their use as working animals. On the contrary, the cross, mare × zebra is more docile and tractable, and can be used like the mule, over which it has the advantage of being much better shaped.

In crosses made in the United States between mares and zebras, the stripes in the coat of the hybrid were indistinct, and the characters of the mother predominated. In other crosses made in South America and Europe, the characters of the father were predominant, and the stripes were still more marked than those of the father.

Potash Salts in the United States of America.

The United States have suffered in common with other parts of the world, from a shortage of potash for manurial and other purposes, but it has made remarkable efforts to supply the deficency from its own resources. The production during 1917, says the *Agricultural Gazette of New South Wales*, October 2, 1918, totalled the very favourable amount of 32,366 tons of available K2O, which was approximately three and one-third times that turned out in the United States for the previous year, while it was about one-eighth of the amount imported during a normal year prior to the war.

From mineral sources production was divided into four groups—from natural brines, from alunite, from dust from cement mills, and from dust from blast furnaces. Of these four, by far the largest production was from natural brines, the amount being 20,652 tons of available K_2O, having at point of shipment a value of about £1,644,000. From alunite (including salts, and crude and roasted alunite) there were three producers, having a total production of 7,153 tons of potash (2,402 tons of available K_2O) and having a total value at shipping point of about £190,000. From cement mills 13,582 tons of potash (1,621 tons available K2O) were produced, the value being £140,000; while the potash from blast furnaces totalled 2,133 tons (184 tons available K_2O) and valued at £14,000.

The production from organic sources is summarized, these sources being kelp, molasses, residue from distilleries, wood-ashes, waste from sugar refineries, evaporated wool-ashes, and miscellaneous industrial wastes. The total amount of available K_2O was 7,506 tons, of the approximate value at shipping point of £781,200.

INSECT NOTES.

ENTOMOLOGY IN JAMAICA.

(*Concluded.*)

Bananas on one estate in St. Mary were seriously attacked by red spider, and considerable damage was done. Experiments in control by the use of lime sulphur spray and 'Black Leaf 40' were being carried out when the hurricane of September 23, 1917, totally destroyed the field.

Since the September hurricane, coco-nut beetles have attracted considerable attention. The following species were submitted to the entomologist: *Strategus titanus*, F., *Metamasius sericeus*, Oliv., *Scalmus interstitialis*, Esch., *Macraspis tetradaetyla*, L., and *Sternodontis damicornis*.

Strategus titanus, the common rhinoceros beetle of the colony, and *Metamasius sericeus* are sugar-cane pests, and both breed in the injured or decayed tissues of several plants. Stumps of cut-over silk-cotton trees are the most prolific source of Strategus in Westmoreland parish, where these trees are abundant, and are cut for making dug-out boats by the fishermen. Scalmus and Macraspis were both found in decaying stumps, and felled coco nut stems. Sternodontis and Macraspis were often taken in injured coco-nut trees after the storm, but their occurrence is regarded as unusual in such locations.

Scale insect attacks on young coco-nut trees were controlled by lime sulphur, 1:15. *Pseudococcus nipae*, Mask., attended by ants, was reported as being severe on newly established trees, and damage to coco-nut foliage by the bag worm (*Oiketicus* sp.) was reported.

A sticker for use in connexion with arsenate of lead and arsenate of lime, applied as a spray to coco-nut crowns, is recommended. This is rosin compound, 1 gallon to 40 of the arsenate spray.

Pine-apples were again badly attacked by the pine-apple weevil (*Metamasius ritchiei*, Marshall) in the infested district. Recommendations for control include the slashing open of infested pines in order that they may quickly dry out, planting only non-infested suckers, and, where possible, the establishment of new pineries, and the destruction of all pines in the old ones, which should be abandoned at least for a time.

Extended investigations by the entomologist again failed to show the presence of the Mediterranean fruit fly (*Ceratitis capitata*, Wied.), and the conclusion is expressed that this insect does not at present exist in Jamaica.

Fruits of the sweet sop (*Anona squamosa*) were found infested by the seed chalcid (*Bephrata cubensis*, Ashm). This insect occurs in Cuba and in Florida also.

The three-lined fig tree borer (*Ptychodes trilineatus*, L.) is recorded.

A twig girdling beetle (*Oncideres cingulata*, Say), was recorded attacking the West Indian almond (*Terminalia catappa*). The small branches and twigs which have fallen to the ground should be collected and burnt, as these contain the eggs and young grubs of the insect. Two beetles of the family Bostrichidae, *Apate terebrans*, Pall, an African species, and *A. submedia*, Wlk., are recorded. These apparently have been in Jamaica for a long time. The latter was bred from orange and pomegranate.

Caryoborus gonagra, F., a well-known Indian insect, is recorded breeding in pods of tamarind.

Termites have caused damage to stored lumber and timber in lumber yards. The species concerned is *Arrhinotermes simplex*, Hagen.

The damage is practically confined to the sap wood of the cheaper grades of lumber. The remedy is storage in such a manner, by means of concrete foundations and metal rails, that termites cannot reach the lumber. Creosoted timbers on concrete blocks may answer the purpose, provided the concrete does not crack and give the insects means of access.

Stored foodstuffs (grain and grain products) have suffered from the attacks of the insect pests common to this class of goods. The stores, from their location in the heart of the inhabited sections of the city, and from their faulty construction for the purpose, cannot be fumigated. The amount of loss is considerable, and conditions of storage should be improved so that this loss could be avoided.

A small brown cricket (*Gryllodes sigillatus*, Wlk.) caused much damage by its attack on stored dress stuffs in Kingston. This is the common house cricket of the colony.

Roses were damaged by a Chrysomelid beetle which is being described as *Metachroma rosarum* by Dr. G. A. K. Marshall.

A conspicuous red and blue beetle appeared in great numbers on sugar-cane in St. James and the Vere section of Clarendon. No injury to the canes was recorded.

A fly (*Hermetia illucens*, L.), which occurs in insanitary places, was reported from one estate. The remedy is to be found in improved sanitation generally.

A fulgorid (*Ormenis perpusillus*, Wlk.) appeared abundantly on coffee in Manchester, but did no damage so far as was observed.

Other insects referred to in the report are: *Aspidiotus pimentae*, Newstead, on pimento; *Plectothrips pallipos*, Hood, on pimento; *Spartocera fusca*, Thb., on Irish potato foliage; *Diaphania nitidalis*, Cram., on cucumber and pumpkin foliage; *Pieris* sp., on cabbage foliage; *Prodenia dolichos*, L., on turnip foliage; *Fundella pellucens*, Z., on cowpea pods.

In addition to the notes on insects in the section devoted to the report of the Entomologist, there is given in Section 3, Agricultural Experiments, an account of the banana borer or the black weevil borer of banana (*Cosmopolites sordidus*).

This presents a summary of the investigations in connexion with the work carried out by the Department of Agriculture in Jamaica into the habits and life-history, and the methods of control of this pest.

The present distribution of the insect is limited, and is centred in a district to which bananas from Martinique were imported some seventy years ago. All indications are to the effect that the banana weevil has been present in Jamaica for many years.

Good cultivation and clean management are said to be sufficient to control the banana weevil enough to prevent its exerting any injurious effect on commercial bananas.

Banana suckers for planting may be disinfected by soaking under water for forty-eight hours.

Domestic fowls eat the weevils readily, and small settlers should be encouraged to keep fowls, and to allow them to forage among the banana plants.

Sliced banana bulbs scattered about the fields as traps for the beetles have been found very useful.

H. A. B.

TICK DESTRUCTION.

The standard formulæ as used by the Department for the preparation of effective washes for the destruction of ticks on cattle are given in the Annual Report of the Department of Agriculture, Jamaica, for the year ended March 31, 1918. They ought to be useful in other islands as well, and are reproduced below for general information. The results of their use at the Government Stock Farm, Hope, are summed up by the Director of Agriculture, Jamaica, as follows:—

'During the past year the whole herd at Hope was dipped sixteen times, or approximately every three weeks. The materials used were 39½ lb. arsenite of soda, and 89½ lb. of paranaph, costing £2 2*s.* 6*d.* The average cost per head of dipping cattle for the year was only 2*d.*

'It is rare to find ticks on the cattle, and the regular dipping is carried out for preventive reasons. We have, however, certain sources of chronic infection with ticks that are at present insuperable, viz., ticks invading our pastures along the line-fences from our neighbours' lands, and, secondly, ticks derived from horses and mules.

'The dipping of horses and mules in a cattle dipping tank is somewhat risky, although we have passed some horsekind through the tank at Hope without disaster.

'We have been forced to rely on the human element for the control of the ticks on our horsekind, by spraying, and painting with "sheep-wash." As every tick that escapes the vigilance of the men who look after the horsekind provides 2,000 more to keep up this plague, it is apparent that where mixed stock are kept, the complete eradication of ticks on a property in Jamaica is not possible.

'At the same time, ticks that are derived from horsekind do not impart tick-fever, and they are therefore not dangerous to cattle.

'A remarkable feature of dipping is the way in which long-haired cattle are completely freed from ticks. The use of a dipping tank on a beef cattle pen would undoubtedly enable a higher standard of English blood to be used to advantage. Hitherto the long hair of the English breeds was a most serious drawback, owing to the tick plague.

'Where spraying is carried out, long-haired cattle must be clipped to ensure the killing of larval ticks. With a dipping tank this is quite nnnecessary.'

In connexion with the above, it may be noted that tick fever is not known to occur in the smaller West Indian Islands

Paranaph and Arsenic Wash.—The most economical and effective source of arsenic for adding to paranaph for the destruction of ticks on cattle is Commercial Arsenite of Soda, 80 per cent.

INSTRUCTIONS FOR USE.—WARNING.

Arsenite of soda is a dangerous poison, and must be carefully guarded under lock and key and kept in a receptacle marked 'Poison.'

A.—*Standard wash for use as a Spray*:—

1. Arsenite of soda	1 oz.
2. Paranaph	2 quarts or 5 lb.
3. Water	12 quarts.

Dissolve ½ lb. of arsenite of soda in 2 quarts of water. Cold water will suffice if some hours are allowed for the powder to dissolve. Shake or stir at intervals. Some undissolved sediment will always remain. Store this solution of arsenite of soda as *Stock Solution of Arsenite of Soda*

For every mixing of paranaph at the rate of 2 quarts or 5 lb. of paranaph in 12 quarts of water, add one condensed milk tin (1 lb. size) full or filled to within ½ inch of the rim with the 'Stock Solution of Arsenite of Soda' as described above. This quantity contains 1 oz. of arsenite of soda.

B.—*Commercial wash for use as a Spray* (economical):—

1. Arsenite of soda	3½ oz.
2. Paranaph	1 lb.
3. Water	10 gallons.

Dissolve the paranaph in the water, and add 3½ oz. of arsenite of soda or 3½ condensed milk tins full of 'Stock Solution of Arsenite of Soda.' Use tank or rain-water if procurable.

C. *Dip for use in Dipping Tanks*:—

1. Arsenite of soda	2 lb.
2. Paranaph	3 lb.
3. Water	100 gallons.

EXPLANATORY NOTES.

Formula A is the most efficient spray for cattle yet tested at the Government Farm at Hope. It is somewhat expensive, owing to the large amount of paranaph. Where long-haired stock have to be dealt with, a large proportion of paranaph is required.

Formula B is a cheaper formula for the control of ticks by spraying, where expense is a consideration. It is not so efficient as A, but kills ticks very well for practical purposes of control.

Formula C is the standard departmental liquid for use in dipping tanks, and has been found highly efficient.

HOME CURING OF BACON AND HAMS.

The Imperial Department of Agriculture in its publications has pointed out for some time past the possibilities in the West Indies of a large production of meat. In the last few months trials have been made in some of the islands in curing hams and bacon on a small scale for home consumption. In Antigua, for instance, there are some housekeepers now who regularly and successfully supply their homes themselves, and excellent hams and bacons are turned out, as the writer of this note can testify.

The trouble in the past in salting meat in tropical countries has been that when put into the pickle it takes some days before the salt can penetrate to the bone of the joint, and it is just there that the meat begins to spoil, as it is apt to do only too quickly in a high temperature.

In Antigua, however, it has been found that by using the 'Turley Meat Salter' the brine is inserted first right down to the bone, and during the further processes of salting and smoking, the meat remains perfectly fresh. This instrument is constructed on the principle of an ordinary medical hypodermic syringe, only much larger and stronger. It is manufactured by T. J. Turley, Owensboro, Kentucky, who states in an advertisement recently received at this Office that the price, with full directions, is $6·50 prepaid. He will doubtless give further information to anyone making inquiries.

In 'Notes on the Products of the Harar plateau, Abyssinia', published by the Poona Agricultural College, Lieutenant E. S. Corlett says that in that part of the world, to which the coffee plant is indigenous, its leaves are cut and dried in the shade, being then sold as tea. Broken up and boiled for a minute or so, they produce an excellent drink much resembling a mild tea. It is much esteemed by the natives as a thirst quencher, especially in the hot weather.

GLEANINGS.

The Times, December 16, 1918, reports that Canary bananas were on the market for the first time for two years.

From information supplied to the Imperial Commissioner of Agriculture by Mr. John R. Bovell, I.S.O., Superintendent of Agriculture, Barbados, it appears that the area of Sea Island cotton grown in Barbados for the year 1918 was 1,445 acres, of which 17 acres were under ratoon cotton.

The Legislative Council of Jamaica has voted £10,000 to establish an institution for training disabled soldiers, and has sanctioned the expenditure of £900,000 from a loan for public works in view of the return of 6,000 physically fit men. (*The Times*, December 14, 1918.)

The St. Croix *Avis* of December 21, 1918, quotes a statement in the St. Thomas *Mail Notes*, December 17, to the effect that the authorities have at last decided to exterminate that little exterminator, the mongoose. The price offered is not bad, 5c. for each male and 10c. for each female.

In 1917 the control of malaria by measures against anopheline mosquitoes, undertaken by a local community in the United States, following anti-mosquito demonstration studies in 1916, resulted in a decrease in the number of cases reported, of 85·5 per cent. (The *Review of Applied Entomology*, November 1918.)

It has recently been announced that an Interim Forest Authority has been appointed to make preliminary arrangements for developing afforestation in the United Kingdom. The carrying into effect of a sound forest policy is, from several points of view, of the utmost national importance, and the hope may be expressed that the new forest authority will everywhere receive sympathetic support from farmers, estate agents, and land owners alike. (The *Journal of the Board of Agriculture*, November 1918.)

The *Morning Post*, December 23, 1918, says that it is understood that several wooden steamers recently built in America have been allocated to the United Fruit Company by the United States Shipping Board, and that some of them will be placed on the Jamaica service. It is also understood that the Shipping Board of Great Britain will shortly hand back to Messrs. Elders and Fyffes several of their vessels which had been requisitioned for war purposes, and that the service between Jamaica and the Motherland will be improved in the near future.

One of the greatest peanut-producing countries of the present day is the United States of America. In the last ten years the increase in production has been very rapid, and the most recent valuation in the peanut belt estimated the holdings a worth £4,000,000. No less than 220,000 farms aggregating 885,000 acres are engaged in peanut production. In 1908 the estimated value of the crop was £2,400,000, and since then there has been an increase of 25 per cent. (*Farmers' Bulletin* No. 119, Department of Agriculture New South Wales.)

In an editorial note on women's work on the land, the *Journal of the Board of Agriculture*, October 1918, says that in spite of difficulties due to a number of causes—lack of physical strength, lack of training, initital want of organization, feminine idiosyncrasies—it may be said that on the whole, the work of the women on the land has proved a conspicous success. Women have entered the field—in the literal sense of the word—in all branches of farm work, from motor-ploughing to thistle cutting, and from stock-rearing to thatching and hedging.

The *Cuba Review*, October 1918, reports the formation of a powerful corporation for the cultivation of fibrous plants and the manufacture of jute sacks for use in the Cuban sugar industry. A well-known syndicate of Habana bankers is to take care of the financial end of the undertaking. It is said that arrangements are now being completed whereby huge quantities of jute seed will be purchased in India, and shipped to Cuba for planting. It is hoped that 10,000,000 lb. of jute will be grown in Cuba within the coming year, and with modern decorticating machinery already on hand for the extraction of the fibre, existing textile mills should be able to start work on the sacks without delay.

During the past year the Agricultural Relief Allies Committee of the Royal Agricultural Society of England have given help to the farmers in the devastated areas of our Allies, as military contingencies permitted. The relief given includes about 9,000 fruit trees, which were distributed with a view to repairing the damage done by the enemy in the orchards of Northern France. Since the improvement in the military position in France, the Committee have sent a consignment of Kerry cattle for distribution in the regions recently liberated. (Annual Report of the Council of the Royal Agricultural Society of England, December 1918.)

The Philadelphia *Farm Journal*, January 1919, says that there is a good market for rabbit skins at present. Before the recent war an enormous trade was carried on abroad. It is said that Great Britain and Ireland alone produced about 30,000,000 skins annually. Most rabbit skins are sold in bales, by weight, the fur from them being used for felting purposes, and the skins for making glue. The war interrupted the importations from Europe and Australia to such an extent that the price has greatly increased. The better skins are sold by the dozen. When dressed they become the 'cony' of the fur trade, often sold under fanciful names. American breeders are raising all kinds of rabbits that produce the best 'cony' of the fur shops.

THE GRAIN SORGHUMS.

All sorghums were at first supposed to be derived from a wild species of grass, viz., *Andropogon halepensis*, of which Johnson grass is a typical representative. The underground creeping rootstocks of Johnson grass, however, and its perennial character, make it extremely difficult to reconcile it with our annual sorghums. Sudan grass, which is really half a grass and half a sorghum, appears more closely related to the sorghums; and it seems more feasible to believe that the sorghums have been derived from a wild species of grass, such as Sudan grass, than from such a plant as Johnson grass.

Sorghums have been known and cultivated almost from time immemorial, and Egyptian records of this class af fodder plants have been discovered dating as far back as 2590 B.C. At the present time sorghums are grown for one of three purposes—for forage, for grain, or for brush. In early time, however, it was grain sorghums which were mostly grown. This was probably due to the fact that the seed was one of the chief sources of diet of mankind, just as it is at present among many of the native tribes of Africa. As civilization progressed, and social conditions changed, the use of the grain as an article of man's diet diminished, and for a considerable period the cultivation of the grain sorghums was not encouraged. Especially was this so because the stems were not considered the best form of animal forage, owing to their pithy contents, and much better results could be obtained from the saccharine sorghums. Of late years, however, certain characteristics have been discovered amongst the grain sorghums which are highly important in the economy of farming, particularly in dry areas. These are: (1) their ability to set grain sometimes in large quantities, under very adverse conditions; (2) the nutritive quality of the grain; and (3) the remarkable drought-resisting properties of the plants.

There are four varieties of grain sorghums of economic importance, referred to in the *Agricultural Gazette of New South Wales*, October 2, 1918, viz. Kafir, Milo, Feterita, and Kaoliang

Kafir sorghum is a native of South Africa, and, until just lately, has been the best known and most grown in European countries.

Milo probably originated in North Africa. It is only quite recently that its cultivation in America has been carried out to any extent.

Feterita originated in the Sudan, and, although of the White Dhurra type, it is distinct from Egyptian corn. It is becoming increasingly popular in the United States.

Kaoliang is a native of Eastern Asia, and although a very old sorghum, it is the latest arrival in America. It is probably the principal crop grown in Manchuria.

Both Feterita and Kafir have whitish seeds, and Milo and Kaoliang brownish seeds, but differences in the stem and shape of heads distinguish them from each other. Kafir produces fair fodder yields, but no grain in semi-arid districts. It is the slowest maturing of all the sorghums, and can only be recommended under irrigation and for parts of the coast. Milo is an excellent sorghum for semi-arid districts and for irrigated areas. Yields of 30 bushels and upwards can be expected. Feterita at present shows a tendency towards tillering, but in all other respects equals Milo. Kaoliang produces seeds very quickly and under adverse conditions, but the yields are generally light.

Grain sorghums are admirably adapted as summer crops in those semi-arid districts where maize-growing is not practicable.

In the West Indies sorghum has been grown for a long number of years under the name generally of Guinea corn, and probably the old variety came with the slave ships from the African coast. At the present time, however, a newer and improved variety known as Mazaggua Guinea corn, seed of which was sent by Mr. George Nugent from Nigeria, to the Imperial Commissioner of Agriculture, in 1903 or thereabouts, has been established in the Leeward Islands, where it has proved successful, and is a fine cropper under the conditions obtaining there.

DEVELOPMENT OF THE ISLE OF PINES.

Since the freedom of Cuba was secured, there has been a continued development of the resources of the Isle of Pines, an island of considerable size lying to the southwest of Cuba and forming politically a part of that republic. American capital is being largely attracted towards developing the Isle. The following notes, which appeared in the *Cuba Review*, October 1918, are interesting, as pointing to possibilities of mineral development, as well as to the value of the grape fruit industry:—

'The Isle of Pines promises to become an important producer of iron, copper, and other ores. Eleven mines have already been located, though only two are being actively developed as yet At one of these, an iron mine near Nueva Gerona, shafts have been sunk to a depth of 117 feet, and apparently fine ore is being found. Assays of samples of this ore are being made in the United States and Cuba. A copper mine, also near Nueva Gerona, only awaits the necessary machinery to begin development work.

'Little has been done at the other mines, chiefly because their boundaries have not yet been officially established. A few days ago the chief Cuban Government mining engineer arrived here, accompanied by two assistants, and the work of establishing the boundaries is now under way.

'The Cuban Government is taking a most active interest in the development of these mines, four of which are said to be owned by Americans, with an American engineer as manager, and the others by Cuban corporations.'

'The harvest of grapefruit, at present the principal product cultivated by American fruit growers on the Isle of Pines, is now well under way.

'While the continuous hot weather of this summer ripened the fruit somewhat sooner than usual, it also improved its quality, but the crop, in comparison with former years, is a very unimportant one as regards quantity.

'The damage to the trees by the hurricane of last September, coupled with a lack of chemical fertilizers, has resulted in a yield of fruit far below the normal. It is expected that about 20,000 cases will constitute this year's crop, whereas the normal crop runs between 50,000 and 55,000 cases.

'While the quantity of grapefruit harvested this year is discouraging to the growers, it is expected that their losses will be somewhat offset by higher prices obtained in the United States for the early fruit. Reports on the first shipments are very favourable in this respect.'

PLANT DISEASES.

PLANT DISEASES IN JAMAICA.

The report of the Micro-biologist, Mr. S. F. Ashby, in the Annual Report on the Department of Agriculture, Jamaica, for the year ended March 31, 1918, contains much of interest to West Indian readers. It is largely reproduced below.

It appears that the number of samples collected or forwarded to him for examination during the year reported on was 108, apportioned among cultivated crops in the following way: bananas, 21; coco-nuts, 51; miscellaneous (mainly canes, citrus, and cacao), 36.

BANANAS.

Panama Disease or Banana Wilt.—Cases have been found in districts hitherto free from disease, and new centres on cultivations diseased in the previous year. In the district where disease has been found constantly for the last six years the cultivators have begun to give main attention to canes and ground provisions, so that fewer cases may be anticipated in the coming year. Soils in bananas from several parishes have been examined (dilutions planted out in acid sugar asparagan agar), and in all cases have yielded fusaria. Two species were found in abundance—fifty 4,000 colonies from the gram of soil—one very like the kind causing disease (a variety of *Fusarium vasinfectum*, Atk.), and the other *F. radicicola*, Woll. The former kind (at least two varieties) was frequently as abundant in banana soils where disease was unknown as in soils around affected plants; a form absolutely identical in growth, reproduction, odour, etc., with the kind always isolated from the diseased plants, has not been separated from soils. Cases of other banana diseases have not been reported during the year.

COCO-NUTS.

Bud rot.—This disease (or diseases) is causing appreciable loss on a number of estates in the eastern parishes.

The shaking and breaking of limbs by the hurricanes in three successive years, with the consequent set-back in growth have weakened the trees, and made them ready victims to attack by parasites. Many cases of bud rot have shown up within the last two months in trees not badly damaged by the September hurricane. The disease in the eastern parishes shows as its first visible symptom a wilting and withering of the heart leaves. A soft stinking rot is usually found in the heart (stalks of youngest leaves, and the apex of stem).

The bases of the young limbs around the heart show spots penetrating the strainer, and even going through the thicker parts. In such spots, and in the heart where the tissue is not soft-rotted, mycelium of the Phytophthora type is present. A Phytophthora-like fungus has been isolated from heart-leaf spots in a case of bud rot, from water-soaked tissue of the limb of the heart leaf, and from the husks of full-grown but immature nuts. This fungus, obtained in pure culture, is very probably identical with *Pythium palmivorum*, Butl., which has many characters of a Phytophthora. *P. palmivorum* causes bud rot of coco-nuts in India. Its probable presence in the West Indies raises the question as to whether *Bacterium coli* (or its allies) is ever the primary cause of a bud rot, and whether it can reach to and enter the uninjured heart tissues without the aid of the fungus.

Another peronospore fungus, an undoubted species of Phytophthora, has also been isolated from coco-nut limbs on several occasions; it was found in extensive spots and patches on the bases of older limbs in the thick tissues and the strainer: in the trees examined it was working in from limb to limb, but too slowly to reach the heart. The preventive treatment referred to in the report for 1916-17 was continued on some estates in St. Thomas, but was ended abruptly by the hurricane. The results were uneven and, on the whole, unconvincing. A series of well planned experiments covering two or more years, financed by Government (Imperial), and under the control of a mycologist, is necessary to work out the problem of preventive treatment. Results would be of the greatest value to coco-nut planters in all British tropical countries, as bud rot is now very widely spread.

Leaf Bitten Diseases (*Leaf Bite*).—These diseases have been treated on an extensive scale by planters in the north-eastern parishes. Promising results have been obtained in spite of the hurricanes.

MISCELLANEOUS.

The gall disease of sweet potatoes, due apparently to a species of Albugo, showed further extension in upper Trelawny. The disease of pimento with 'fire blight' symptoms was again observed on one property. The causal fungus was again isolated, and yielded a perfect fruiting stage, proving it to be *Rostrella coffeae*, Zimm. Coffee in the same field was not affected. *Corticium vagum*, var. *solani* was found to be the cause of a rot of yams, working inwards and causing a separation in layers.

Samples of potatoes (Irish) from several points were attacked by late blight (*Phytophthora infestans*) in January and February: the disease might be brought in the imported tubers used for seeds, and its appearance here connected with its severity in the exporting districts of Eastern Canada during the preceding summer. Growers of potatoes in the uplands should make a point of spraying with Bordeaux or Burgundy mixture six weeks after planting, and repeating once or twice more, in dependence on weather.

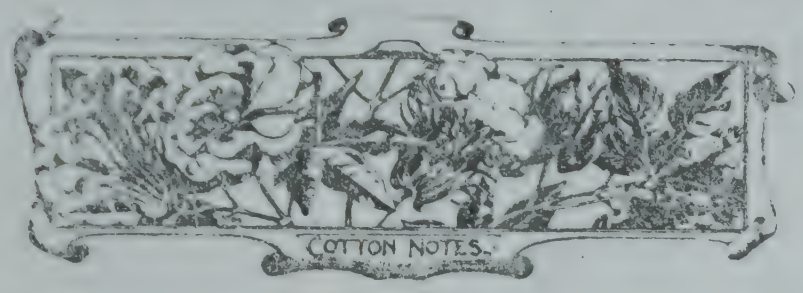
A defect of copra, known as honey comb, was found to be caused by *Bacillus mesentericus vulgatus*. The strain was markedly thermophile, as it grew on meat and caused the fault at a temperature of 150° F. Copras from hot air and steam pipe driers are affected. Fumes of burning sulphur entirely prevent the fault, the critical period being the first ten to twelve hours in the drier.

The fungi parasitic on the spiny citrus fly (*Aleurocanthus Woglumi*), which have become conspicuous in some districts during the last few years, continue to exercise an appreciable control of the fly.

During the latter part of the year, thanks no doubt to a period of over-cast sky and rather frequent showers, they were well developed in cultivations on the south side dry coastal plains. Three such fungi are active here:—

1. The Bright Red fungus (*Ischersonia aleyrodis*).
2. The Dull Red fungus (*Aegerita Webberi*).
3. The Cinnamon fungus (*Verticillium heterocladum*).

The first and last produce microscopic spores in abundance, hence can be spread easily by spraying on the trees a suspension of the spores in water. The second produces no true spores but a restricted number of brown rather large blackberry-like bodies bearing blunt spines, and are scattered on the silky strands of outgrowth on the under sides and edges of the leaves: the spines germinate quickly, giving rise to long infection threads: this fungus has all the vegetative characters of a Corticium, and its reproductive bodies may be rudimentary sclerotia.



COMPARATIVE TOXICITY OF COTTON SEED PRODUCTS.

As was noticed in an article in the *Agricultural News*, February 23, 1918, Messsrs. W. A. Withers and F. E. Carruth, of the Chemical Division, North Carolina Agricultural Experiment Station, have isolated a distinctly toxic substance from cotton seed, to which the name gossypol has been given. Notwithstanding this, a theory has been advanced offering to explain cotton seed meal poisoning or injury as owing to dietary deficiencies.

Messrs. Withers and Carruth have undertaken a further series of experiments on four different species of animals, a report of which is contributed by them to the *Journal of Agricultural Research*, September 2, 1918. The summary of the results obtained and the conclusions arrived at are quoted below.

Various cotton seed products, including raw cotton seed, kernels, ether-extracted kernels, gossypol, and several meals, have been fed to rats, rabbits, poultry and swine.

Raw cotton seed kernels and the gossypol therefrom have been found highly toxic to all these animals. Cooking the kernels under oil-mill conditions causes a profound reduction in toxicity. This change is so great that the thoroughly cooked products show no pronounced toxic effect on rats and poultry in suitable diets. Thoroughly cooked meals, however, appear to be definitely injurious to rabbits and swine, which are peculiarly susceptible to cotton seed meal 'injury.' Rats and fowls are able to withstand much larger relative amounts of cotton seed meal for longer periods. In the 'cold-pressing' process of making cotton seed meal the toxic substance passes into the oil to a great extent, thus leaving a meal which may be less harmful than certain hot-pressed meals.

Cotton seed meal, cotton seed flour, and ether-extracted raw cotton seed kernels have been fed to rats under comparable conditions. Rats fed on extracted kernels have shown superior growth over those on cotton seed meal or cotton seed flour. From this fact it is inferred that even in well-cooked products there remains something slightly deleterious to rats fed on diets containing these as the sole source of vitamines, protein and minerals. Diets containing well cooked cotton seed products, with a small amount of milk powder, appear to be as efficient for rats as the control milk diet.

The degree of toxicity of cotton seed meals depends on the thoroughness of cooking in the oil mill. This change appears to be due to oxidation of the gossypol to a substance which we have called 'D-gossypol'. Some meals may be much more toxic than others, through failure to complete this change. Since evidence shows that the gossypol of the raw seed may be entirely changed to this far less toxic material, it is suggested that the highly toxic effect of the raw cotton seed be described as cotton seed poisoning, and that injury due to the meal be described as cotton seed-meal poisoning or injury.

Diets containing cotton seed meal with corn meal, or soy bean meal with corn meal, as the sole source of nutriment have led to failure of our rats. The addition of calcium lactate, sodium chloride, and butter tends to avert this failure.

Rabbits are much more susceptible than rats to cotton seed meal poisoning. They have been very quickly affected by much smaller relative amounts of the meal in diets which are apparently adequate for these animals.

Aside from an apparently diminished egg production, excessive amounts of cotton seed meal have not appeared to be very injurious to hens. Some evidence is presented to show that the presence of unchanged gossypol in the diet may cause a peculiar discoloration of the egg yolk.

Pigs have been fed on diets designed to compare the effect of cotton seed meals with similar protein concentrates, such as peanut meal, soy bean meal, and other extracted cotton seed kernels.

Unsuccessful attempts have been made to avert cotton seed meal 'injury' by supplementing a thoroughly cooked meal with (a) meat scrap, calcium lactate, sodium chlorid, and butter fat, or (b) 10 per cent of skim-milk powder.

Cotton seed meal exerts on pigs a harmful effect, which is not averted by improving the diet with efficient food materials. Such a harmful effect is not produced by similar foodstuffs. Hence, we conclude that the cotton seed meal 'injury' of swine is due, not to deficient diets, but to the presence of a toxic substance. In our opinion this toxic substance in cotton seed meal is the derivative of gossypol which we have called 'D-gossypol.'

The general conclusion is that there remains a toxic factor in all the samples of cotton seed meal and cotton seed flour used in the experiments, although in the manufacture of cotton seed meal the gossypol undergoes some change whereby the meal is rendered much less toxic than the original raw feed.

PRICES OF ESSENTIAL OILS.

The *Perfumery and Essential Oil Record*, December 1918, gives a list of approximate values of the various essential oils on the English market at the end of every month in 1918. From this it appears that Bay oil, which was quoted at 13*s.* per lb. in January, had risen to 22*s.* in December. Lime oil, distilled, was 8*s.* per lb. in Jauuary, but had declined to 6*s.* in December, while hand pressed had fallen from 20*s.* to 16*s.*, West Indian Orange oil fetched 8*s.* per lb. in January, rising during the course of the year to 9*s.*, but dropping to 8*s.* 6*d.* in December. It is intended to insert among Market Reports in each issue of this Journal the latest quotations to hand of these West Indian essential oils.

In this connexion the *Record* referred to above has noted from time to time during the year considerable extension in the West Indian lime oil industry, and Jamaica orange oil is well known as a regular article of commerce. But if oranges and limes can be made to yield their essence, there does not seem to be any reason why the lemon should not be 'pressed' to a similar service. At any rate, until a thorough trial is made, it would hardly be reasonable to state positively that Caribbean lemon oil is not a commercial possibility.

In other fields within the Empire Nigeria limes; South African eucalyptus; Cyprus coriander, aniseed, and cummin; Seychelles and Montserrat ajowan; and Fiji bay oils have all been noted in the issues of the *Record* during the year 1918.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 12.

BALATA—Venezuelan Block, no quotations; Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 90/-; Grenada, 85/-; Jamaica, no quotations.
COPRA—£46.
HONEY—West Indian, 230/- to 232/6.
LIME JUICE—Raw, 4/-; concentrated, £30.
PIMENTO—6*d*.
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD December 1918.

BAY OIL—Firm, at 22*s*; Lime Oil—Slow, at 6*s*. for West Indian distilled, and 16*s*. to 17*s*. for hand pressed; Orange Oil—West Indian commands 8*s*. to 8*s*. 6*d* per lb.

Barbados.—Messrs. T. S. GARRAWAY & Co., January 14.

ARROWROOT—$10·00 per 100 lb.
CACAO—$16·00 per 100 lb.
COCO-NUTS—$38·00 husked nuts.
HAY—No quotations.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations
SUGAR—Dark Crystals, $5·50

Trinidad.—Messrs GORDON, GRANT & Co., December 9.

CACAO—Venezuelan, $16·75 to $17·25; Trinidad, $16·50 to $17·00.
COCO-NUT OIL—$1·51 per gallon.
COFFEE—Venezuelan, 13c. to 14c. per lb..
COPRA—$7·25 per 100 lb.
DHAL—$10·00 per bag.
ONIONS—$8·00 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $5·60 per 100 lb.
RICE—Yellow, $14·00 to $14·50; White, $9·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs GILLESPIE BROS & Co., January 11.

CACAO—Caracas, 17c. to 17½c.; Grenada, 15½c. to 16c.; Trinidad, 16½c. to 16¾c.; Jamaica, 15c.
COCO-NUTS—Jamaica selects, $52·00; Trinidad culls, $27·00 to $28·00 per M. $53·00
COFFEE—Jamaica, 18½c. to 21½c. per lb.
GINGER—18c. to 20c. per lb.
GOAT SKINS—Market unsettled.
GRAPE FRUIT—Jamaica, $3·50 to $4·00.
LIMES—Nominal $7·00.
MACE—43c. to 45c. per lb.
NUTMEGS—28c.
ORANGES—$4·00 to $4·50.
PIMENTO—8¾c. per lb.
SUGAR—Centrifugals, 96°, 6·055c; Muscovados, 89°, 5·155c Molasses, 89°, 5·052c. all duty paid.

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	PAGE.		PAGE.
About Cuba, ...	43	Items of Local Interest ...	43
Acacia Seeds, Vitality of	41	Liming, Effect of on Crop Yields	41
Agriculture in Barbados	43	Maize, Inter-cropped with Legumes	35
Camphor Trees in the West Indies—A Correction	40	Market Reports	48
Coffee, Toxic Principles of	41	Moulds in the Soil, The Action of	33
Cotton:—		Notes and Comments ...	40
Cotton Legislation in St. Vincent	38	Paper Yarn	46
Cotton Seed Distribution in Egypt	38	Plant Diseases:—	
Sea Island Cotton Market	38	The Root Disease or Red Ring Disease of Coco-nut Palms	46
Sea Island Cotton Production in the West Indies	39	Sisal Cultivation in British East Africa	35
Department News	37	Sterilization of Seed-Beds	37
Departmental Reports ..	45	Sugar Industry:—	
Epidemic, A Curious Local	47	The Standardization of Molasses	36
Gleanings	44	The Sugar Factories in Antigua and St. Kitts	36
Grasses for Paper-making, South African	39	Utilization of Molasses	37
Insect Notes:—		Yam Cultivation, An Experiment in	40
Suggestions for Mosquito Control in a West Indian Island	42		

The Action of Moulds in the Soil.

THE term 'mould' is applied to various species of fungi isolated from the soil, which belong to widely scattered groups, and no sharp limitation is to be placed on the use of the term.

The importance of the action of moulds in the soil has been the subject of investigations by Selman A. Waksman, of the Department of Soil Bacteriology, New Jersey Agricultural Experiment Station, and he has recorded the results he obtained in a paper in *Soil Science*, August 1918. The question is of general interest to agriculturists in relation to soil fertility; a résumé of the paper is therefore given below.

When a group of micro-organisms is studied in relation to soil fertility, the question is—what part do they play in the nitrogen changes in the soil, produced as a result of their activity? From the early period of investigations on the microbial inhabitants of the soil, up to four or five years ago, the attention of soil bacteriologists was chiefly directed to the study of bacteria, neglecting other groups of micro-organisms to which the term moulds is applied. It has only been in very recent years that the great abundance of other micro-organisms besides bacteria in the soil has been demonstrated, and an attempt made to explain their part in soil fertility.

It has been definitely established that moulds together with protozoa, algae, etc., are common inhabitants of the soil, and form a large and important group of the soil flora. Hundreds of species of moulds have been isolated from the soil, and it has been found that many moulds occur in different soils under different topographic, climatic, and soil conditions. The same species has been isolated from soils in different European countries and from soils in various parts of America. New species, never met with before, have been isolated from soil, serving as a proof that some of them at least are typical soil organisms.

It has also been found that moulds develop readily in acid soils, and are more active in forest and in compact poor soils, while bacteria predominate in loose soils rich in nutrient matter, cultivated and fertilized. In fact

in well cultivated lands containing relatively little humus, bacteria play a very important part, and occur in great numbers, and the moulds are of minor importance: while the upper layers of soil in forests, rich in humus as they are, contain a large number of moulds. In rainy seasons also the surface growth of moulds is greatly favoured; otherwise they live and produce spores below the surface among the vegetable residues and the living plant roots. It has been demonstrated that not only are moulds present in the soil, but that they actually live there, and produce mycelia, which necessitates their taking an active part in the different biological transformations of the soil.

Thus to be able to interpret the part played by these organisms in the soil, they must be studied as living organisms, which by their metabolic processes help in the various transformations of both organic and inorganic soil constituents, and in this way influence soil fertility.

The question of nitrogen fixation by moulds seems to be that, with the exception of some rather rare organisms, typical soil moulds do not play any direct part in the nitrogen enrichment of soils. Nor has the formation of nitrite or nitrate ever been demonstrated for any of the moulds, so that these important activities must be eliminated from the field of mould action.

On the other hand, the moulds are found to play a very important part in the disintegration of organic matter in the soil, particularly in the first stages of decay, which is termed ammonification. Whatever may be the process of formation of complex proteins by moulds, it is certain that ammonia is left in the medium as a waste product. If available carbohydrates are present, only small quantities of ammonia will be liberated by the action of bacteria and moulds, but in the absence of available carbohydrates there is a large amount of nitrogen left in the medium by their action. If the ammonia is regarded as an indication of the amount of organic matter decomposed by a living organism, some of the moulds commonly occurring in the soil are found to possess greater powers of decomposing organic matter than are possessed by bacteria. The action of the moulds on the nitrogenous organic matter in the soil may be said to consist in the mineralization of that material, with the production of ammonia and the building up of fungus proteins. The ammonia is used by the higher plants as such, or is oxidized by nitrifying bacteria into nitrates, and so used by plants, or is absorbed again by the micro-organisms of the soils.

The moulds also play an active part in the decomposition of cellulose and other carbon compounds in the soils. This is of great importance, since both green and animal manures, and all vegetable residues need to be decomposed before the minerals and nitrogen compounds can be brought to a condition in which they can either be taken up directly by the higher plants, or in which they can undergo other transformations due to the action of other groups of moulds or bacteria. It is stated that nearly all the simple and complex organic carbon compounds in the soil can be attacked by some group or other of moulds, which thus play an important part in soil fertility. The moulds attack the carbohydrates very readily, perhaps even more readily than the bacteria, and they cause rapid decomposition of these compounds. Although more information is necessary, it appears certain now, that future theories of soil fertility will have to be constructed, not only from the point of view of nitrogenous manures and fertilizers and nitrogen content of the soil, but also by taking into consideration the nature and amount of carbon compounds added to it.

It must be kept in mind, however, that lower plant organisms like moulds, when present in the soil, compete with the higher plants in utilizing nitrogenous compounds for their own growth. Thus the soil moulds may produce an unfavourable effect upon soil fertility. Athough this cannot be denied, two factors may be mentioned as in some degree counterbalancing the possible injury to higher plants. First, an excess of ammonium salts or nitrates in the soil tends to large losses by leaching, especially under wet climatic conditions; the utilization therefore, of some of these salts by the soil moulds may serve usefully for the conservation of some of this nitrogen in the soil, which would otherwise be lost. Secondly, the life processes of the moulds tend to the liberation of ammonia, and to the restoring again to the soil of the nitrogen assimilated by them in an available form. Thus moulds from this point of view, may act in the soil as storing agents for soluble nitrogen compounds; and the possible injury caused by them in competing with the higher plants for the available nitrogen may be more than compensated for by their ability to store the nitrogen, and make it afterwards slowly available for the plants.

Information up to the present leads to the belief that the mould flora is more active in acid than in neutral or alkaline soil, although it does not preclude the fact that moulds are developed also in the latter type of soil. It is possible that some of the soil moulds

are active in the production of acids from available carbohydrates: thus soil acidity may be due in some part not only to the production of mineral acid owing to the oxidization of minerals or added fertilizers, but also to the production by soil moulds of organic acids, such as citric and oxalic. These acids may also act upon the insoluble phosphates and other minerals in the soil, and bring them into a soluble form available for the higher plants.

One other point with regard to moulds is worth noting. Plant pathologists know that a soil may become 'sick' with respect to a particular crop, due to the fact that continuous cultivation of one crop on the same soil has caused that soil to become infested with large numbers of organisms pathogenic to that particular crop. Parasitic moulds of this type have, however, been isolated from virgin soils, or from soils on which the crop they parasitized has never been grown. Further investigations are needed as to how far the soil may be considered a possible medium for nourishing moulds likely to prove dangerously parasitic.

MAIZE INTER-CROPPED WITH LEGUMES.

The growing of two crops together on the same land would appear to offer the possibility of a number of advantages, especially when one of these crops is a leguminous one. The increased fertility of the soil brought about by the fixation of the atmospheric nitrogen by the root nodules of the legume might result in an increased production of other crops grown along with it. Again, the physical condition of the soil might be improved by the accumulation of humus if the legume were ploughed under as a green manure. A combination of crops would also appear to offer a means of controlling weeds, and possibly of checking the spread of plant diseases. On the other hand, it is by no means certain that inter-cropping would always be advantageous, since it is quite possible that the subsidiary crop might retard the growth of the principal crop in the same way as weeds do.

Some experiments on the effect of inter-cropping with various legumes on the production of grain and stalks by maize are reported in an article which appeared in the *Philippine Agriculturist*, September 1918. Both the immediate effect and the effect upon a succeeding crop of maize were studied, and a comparison also made between planting in the wet season and in the dry season.

The following conclusions were arrived at:—

(1) Legumes had only a remote beneficial effect, if any, on either stalk or corn production when inter-cropped.

(2) When a legume, such as cowpea, is inter-cropped with corn, the value of the crop usually more than counterbalances the possible decrease in production of corn. For this reason, growing such legumes side by side with maize may possess an advantage over growing the maize crop alone. It does not seem, however, that there is any advantage to be gained by inter-cropping maize with legumes solely for the purpose of furnishing the maize with a nitrogenous fertilizer.

SISAL CULTIVATION IN BRITISH EAST AFRICA.

In an interesting article on settlement in British East Africa, in *The Field*, December 28, 1918, a promising account of the sisal industry is given.

The writer says that of all the crops produced in British East Africa, sisal has so far proved the most promising. Its fibre is the production of *Agave sisalana* commonly known as the Century Plant, sometimes erroneously called Aloe. The rich, light red soil of the Thika district, 30 to 40 miles north-east of Nairobi, at the head of the Thika branch of the Uganda Railway, gives the best results, and the pick of such land, which ten years ago was easily procurable on a ninety-nine years' lease at a purchase price of £1 per acre, with an annual rental of 1¼*d.* per acre, is now fetching from £5 to £7 per acre, and even more. The fertility of the soil, and the profits of the crop lead one to expect a continued upward movement in land values for years to come.

The forests responsible for the wonderful fertility of the humus were long since felled or burnt down by natives, and the ground therefore is inexpensively cleared, the approximate cost being from 30*s.* to £2 per acre. The best practice is to plant 300 acres the first year, and 200 acres each subsequent year, continuing to break new ground so as to maintain a sufficient acreage to keep the machinery in full swing. The life of sisal from time of planting is about six years. Experiments have been made with inter-planting, but planters are beginning to form the view that this is not desirable, partly on account of the exhaustion of the soil, and partly because of the difficulty of getting rid of the heavy root which is formed in plants cultivated on the fertile soils of the uplands. For the same reasons the land is best left fallow both before planting and after cutting out an old crop. A first ploughing with a single-furrow plough drawn by twelve oxen, and a second cross-ploughing with a double-furrow disc plough, followed by a good harrowing, suffice to prepare the soil, which is then planted by natives, some 650 plants per acre being deemed the best number. Weeding is essential, especially during the first year or eighteen months, after which the plants may be left to mature. In three or four years the leaves, then some 3½ feet to 4 feet long, may be cut and railed to the decorticator or scutching plant, which in one operation removes the 97 per cent. pulp, and prepares the clean white fibre, always in good demand for reaper twine and cordage.

The actual cost of production before the war was £12 per ton, delivered at British ports, and the average selling price in the ten years preceding the war was £33 per ton. The war has enhanced all costs, especially those of freight and insurance, but to-day's official selling price, £99, is most lucrative, and has enabled growers to net handsome returns, which are doing much to hasten the development of the Protectorate, especially as regards fibre production.

Experts are all agreed that East Africa offers for sisal the most satisfactory conditions of any country in the world, not excluding Mexico, the land of its origin, as regards climate, labour, and soil; and it is reasonable to expect that the 10,000 tons now annually produced may in time reach 50,000 tons.

Since the world's total consumption of hard fibres (including Manila hemp) reaches 360,000 tons annually, there need be no scare as to over-production, and as the cost of production in East Africa is lower than in any other country, the expected reduction in prices after the war may be equally disregarded.

SUGAR INDUSTRY.

THE SUGAR FACTORIES IN ANTIGUA AND ST. KITTS.

The fourteenth annual report of the Directors of the Antigua Sugar Factory, Limited, and the seventh annual report of the Directors of the St. Kitts (Basseterre) Sugar Factory, Limited, have been forwarded to the Imperial Commissioner of Agriculturef or the West Indies. Both of these are of considerable interest with regard to the sugar-cane industry in the smaller West Indian islands. They both report on the year ended September 30, 1918.

In Antigua the year was, from an agricultural point of view, a gloomy one. The crops, generally speaking, were at least 33 per cent. below normal, owing to the drought which prevailed. In the northern part of the island the rainfall for the year only averaged 30 inches, while the centre and south, with 35 and 40 inches, respectively, were still far short of the average. Thus the whole island suffered badly. Nevertheless, on account of the high prices for sugar, the factory was enabled to make a fair profit on the year's transactions.

There was some serious trouble amongst a portion of the labourers in Antigua during the year, but the Directors were glad to record that during the disturbances all the factory employees behaved loyally and well, as they did throughout the year.

The Directors regret that, in spite of pointing out in their last report the necessity of more regular deliveries of cane, there has been no improvement. The factory was left during the season for 627 hours out of cane. As they point out, this means a serious loss to the planters themselves, for it means that it took six weeks longer than necessary to finish the crop, which of necessity reduced the bonus that might have been earned, and besides, prevented the ratoons from having as early a start as they might have had for the next crop, and also retarded the preparation of land for planting.

The total tonnage of canes dealt with during the year reported on was 64,282 tons, as compared with 102,601 tons in the preceding season. Of this amount, 16,267 tons were supplied by original contractors, who received £1 19*s* 0¾*d*. per ton, including bonus; new contractors supplied 46,116 tons, paid for at the rate of £1 9*s*. 4*d*. per ton, including bonus; while peasants supplied 1,897 tons at the rate of 18*s*. 10¾*d*. per ton.

The factory charges, which include salaries, wages, repairs, duties, and local taxes, worked out at the rate of £5 11*s*. 1½*d*. per ton of sugar made—a large increase on the charges for the previous crop; railway transport charges were 15*s*. 2¼*d*. per ton—a decrease on the last year's expenditure; while the London Office administration charges were 4*s*. 3¾*d*. per ton. The number of tons of sugar made was 7,316, as compared with 11,705 in 1917, and the total proceeds of sugar and molasses produced was £176,835, as compared with £252,617 in the year before. On the other hand, the expenditure was £124,338, thus leaving a surplus for division of £51,297. Of this sum £19,219 was paid as bonuses to new contractors, while the remainder, £32,778, was equally divided, half being paid as bonuses to original contractors, and half placed to the credit of the shareholders, and is liable to Excess Profits Duty.

The company has had to bear heavy charges in extra taxation. Locally it paid £3,060 as export duty, besides the Excess Profits Duty paid to the Imperial Exchequer of £16,578 in respect of the crop of 1917. In consequence the interest obtained by the shareholders, although fair, cannot be reasonably compared with the profits which may have been declared in similar concerns in places which have not had to bear such extra taxation.

The factory work has again maintained a high level of efficiency. The percentage of sucrose in the canes dealt with shows a rise as compared with the years since 1915, although the purity of the juice and recovery of sucrose were somewhat lower, as might have been expected owing to the dry season; but again, less sugar per cent. was left in the megass than ever before, showing the efficient milling. The fact that there was a good market for molasses led to somewhat less effort being made to secure complete recovery of the sugar from this product.

The report on the St. Kitts Factory also records a very low rainfall during the year, in consequence of which, as in Antigua, the crop was much below those of previous years. On many estates the total crop was from 40 to 60 per cent. below that of 1917, although the estates on the northern side of the island did not suffer so much. The dry weather experienced was reflected in the high fibre content of the canes dealt with, being 16·02 per cent. on the total crop, as compared with an average of 14·15 per cent. in previous years.

The cost of production per ton has been considerably higher in the year reported on than in the preceding year, mainly owing to the fact that the output was 38 per cent. less; but against this the better price at which the sugar was sold must be put.

The total amount of cane dealt with was 62,354 tons, of which 55,820 tons were supplied by original contractors, who received, including bonus, £1 5*s*. 10½*d*. per ton, while outside suppliers furnished 6,533 tons at the rate of £1 5*s*. 6*d*. per ton.

The factory charges were £4 19*s*. 2¾*d*. per ton of sugar made, the railway transport was £1 12*s*. 7¾*d*. per ton, and the administration charges of the London Office were 3*s*. 8½*d*. per ton. The number of tons of sugar produced was 7,314, and the net proceeds of the sale of sugar and molasses were £171,616. After charging this revenue with expenditure, there remained for division a surplus of £32,752, which was equally divided between the contracting cane suppliers and the factory shareholders, the latter portion being liable to Excess Profits Duty.

As in Antigua, the profits are lessened very considerably by the extra taxation, the export duty levied locally having been £4,085, and the Excess Profits Duty paid into the Imperial Exchequer being £24,554 on account of 1917.

This factory also maintains a high standard of excellence in working, as is shown by the following figures: sucrose in cane, 13·02 per cent.; sucrose left in megass, 2·55 per cent.; recovery of sucrose in cane, 86·55 per cent.

Neither of these two factories is at all below the level of work of factories dealing with canes of a similar type in in other parts of the world

THE STANDARDIZATION OF MOLASSES.

The *Louisiana Planter*, December 21, 1918, has something to say about the standardization of molasses. The advice given is sound, and is worth being noted by sugar makers in the West Indies. The molasses from some of them has already a good reputation in the market, but the standard must be maintained if the market is to be retained.

The article referred to says that there is a considerable need of standardizing first molasses. By a very simple change of method it is possible to turn out a first molasses corresponding to any desired requirement. First molasses may be met with which would pass for syrup, with a purity of over 60, and also first molasses with a purity of about 45. It is possible to make this purity anything by capping off first strikes with greater or less quantities of first molasses. In dealing with high purity juices, it is necessary to do this to some extent as a rule, even in making granulated sugar, and if the wash is separated from the molasses proper, the purity of the latter can be materially reduced. First molasses with a purity of about 50-53 when made from sugar-cane is an excellent, palatable foodstuff, and might be used in every household, if it were not for the peculiar fact that you cannot buy it in the grocery stores. Molasses of this type is usually sold at about 42 Be. or 78 Bx. and under ordinary circumstances is not particularly subject to fermentation. There seems to be no good reason why it could not be made in standard quality, and sold in gallon cans in almost unlimited quantity direct to the consumer. As matters stand, the entire crop of first molasses goes direct to large molasses houses, who blend it and treat it in various ways, and eventually send it to the very homes where it should have gone at the outset at a considerably reduced price, and of considerably better quality.

It is also possible to turn out a second molasses with any purity from about 32 to 40. When this purity is allowed to rise to about 38, it is possible to get a second molasses also which is well adapted to human consumption. For this article there seems to exist no present market—a state of affairs, however, which is by no means necessary. As a step forward towards creating a direct market for both first and second molasses, these articles should be standardized, particularly as to purity. Buyers have hitherto attached entirely too much importance to colour. What the consumer mostly desires, however, is flavour, and this seems to be mostly dependent upon purity.

UTILIZATION OF MOLASSES.

Experiments are in progress in Formosa with a view to ascertaining the best methods of utilizing the molasses of large sugar factories. Some account of the work done by Migaku Ishida and his collaborators is given in a report of the Government Sugar Experiment Station, of which an abstract has been furnished by the author. It is stated that the molasses produced in the large sugar factories in Formosa in the campaign of 1915-16 was utilized as follows:—

Manufacture of alcohol	86·9	per cent.
Preparation of alcoholic beverages	15·3	„ „
Exported	8·4	„ „
On hand	7·4	„ „

The total production was about 133,000 gallons.

A carefully considered scheme has been prepared for the study of the various purposes to which molasses can be applied, and certain investigations have already been undertaken. Amongst these are:—

I. A method of purifying molasses.
II. Experiments in removing invert sugar from molasses.
III. Preparation of molasses fodder.
IV. Experiments with molasses as a fertilizer.
V. Experiments on the use of molasses as fuel.
VI. The preparation of solidified molasses.

As regards the first of these matters of consideration, a process has been patented based on the neutralization of the molasses with lime, followed by the precipitation of gums and pectin by alcohol, after which the alcohol is recovered, and a purified syrup is produced.

In connexion with the use of molasses as a fertilizer, it is suggested that the application, which may be at the rate of about 400 lb. per acre, may be made either two weeks before planting sugar-canes, or at the time of planting, and that it is also satisfactory if made one month after the canes have begun to sprout. It is further suggested that molasses may be used in conjunction with sulphate of ammonia and sulphate of potassium without phosphate, the application of molasses appearing to stimulate the absorption of phosphate by the cane.

When used for fuel, molasses appears to be best mixed to the extent of 4 or 5 lb. of molasses per 100 lb. of megass.

STEAM STERILIZATION OF SEED-BEDS.

Tobacco seedlings are specially subject to injury in the seed-bed by weeds and a number of parasitic enemies, among which is a fungus root rot. It is of the utmost importance to secure beds free from weeds, and to avoid the use of diseased or weak seedlings. Methods of sterilization have been developed to control seed-bed conditions. For many years in the tobacco-growing areas of the Southern States of America, the open fire method has been practised. The area selected for use as a seed-bed is cleared, the ground broken, and brush and wood laid over it and burnt. When the burning is done thoroughly, the resulting heat is sufficient to free the soil of all fungi and weed seeds to a depth of several inches, but the organic matter of the soil is largely destroyed. Barn manure and fertilizers, therefore, containing organic matter, must be applied after firing, and this opens the way for the renewal of fungus spores or weed seeds.

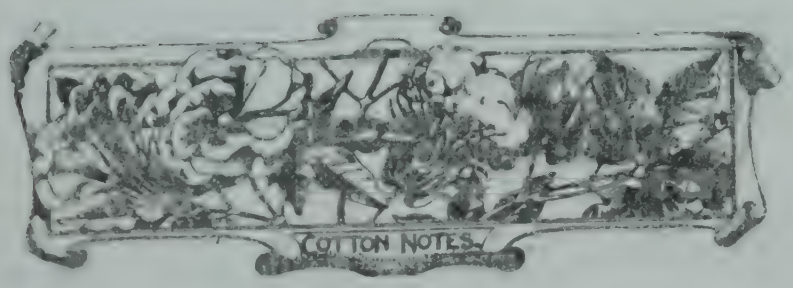
Another method of sterilization by steam is described in *Farmers' Bulletin* No. 696, U. S. Department of Agriculture, which is said to be the most satisfactory method of sterilization which has been developed up to the present time. The essential feature of this steaming process is an inverted pan used to force the steam into the soil. It has been widely adopted in certain tobacco-growing districts. Besides eliminating diseases and improving general soil conditions, it kills weed seeds more effectively than the old methods. The cost of sterilizing, it is stated, is more than paid for by the saving in the cost of weeding, the greatest item of expense being a portable boiler of at least 20 h.p. In some parts of the tobacco-growing districts the owners of steam tractors or portable boilers go from place to place sterilizing beds at fixed prices.

With necessary modifications in the apparatus, the method can also be used very successfully for various other crops besides tobacco.

When steam sterilization cannot be used, one gallon of commercial 40-per cent. formaldehyde solution, diluted in 50 gallons of water, is applied by means of a common watering can at the rate of 2 quarts per square foot of bed, to control seed-bed diseases. The cost of this is greater than that of steaming, and it is less effective.

DEPARTMENT NEWS.

Mr. W. Nowell, D.I.C., Mycologist on the staff of the Imperial Department of Agriculture, returned to Barbados on February 1, after a visit to Trinidad.



SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended January 18, 1919, is as follows:—

ISLANDS. The Cotton Exchange reports the market dull, with no sales, the demand being limited, and Factors still unwilling to meet the decline and sell on a basis of Georgias and Floridas. However, some business has been done on private terms, resulting in sales of upwards of 500 bales on a basis of quotations. Should no better demand spring up, the Factors will in time consent to sell at this decline quoted, which would admit of our buying to advantage. We still think that Fine to Fully Fine Islands, at our quotation, are relatively much cheaper than Georgias and Floridas, being better in grade, staple, and fineness.

We quote viz :—

Fine to Fully Fine Islands, 54c. to 64½c., f.o.b. and freight.

PLANTERS' CROP LOTS OF EXTRA FINE. There is no demand at present, but the crops are firmly held at very full prices, the supply being very limited.

GEORGIAS AND FLORIDAS. The Savannah market remains dull, as the Factors are generally unwilling to accept current prices.

The receipts and sales reported are cotton bought in the interior, and shipped to Savannah to be forwarded to the Northern Mills.

The demand is more general, the mills becoming interested at prices now current. It is possible the small crop (estimated at not over 48,000 bales) will all be required, and that present prices may be maintained.

We quote, viz:—

Extra Choice to Fancy, 54½c., f.o.b. and freight.
Average Extra Choice, 53½c., f.o.b. and freight.

The exports from Savannah for the week have been : to Northern Mills 530 bales, and from Jacksonville to Northern Mills 204 bales.

COTTON LEGISLATION IN ST. VINCENT.

The following notice has been issued by the Agricultural Superintendent of St. Vincent to cotton growers in the colony. It is published as an example of the steps which ought to be taken in every cotton-growing island in the West Indies, if the industry is to be maintained, and the crop protected from the ravages of leaf-blister mite and cotton stainers:—

1. All cotton stalks must be pulled up and burnt before the end of March.

2. Cotton stalks should be burnt in the field as soon as possible after they are pulled up.

3 No cotton may be planted in the month of April

4. It is advised that cotton planting be deferred until the month of June.

5. Near buildings used for storing and sorting cotton all weeds and bush should be destroyed.

6. The borders of cotton fields where cotton stainers and bush bugs may find shelter and food should be cutlassed.

7. Any cotton stainers which may be found near buildings and elsewhere should be collected on heaps of cotton seed, and killed.

8 All cotton-seed traps should be inspected daily, prevent the cotton stainer breeding after feeding on them.

It must he noticed that the first three sections are subjects of legislative enactment, and failure to comply with them entails legal pains and penalties. Without the thorough carrying out of regulations like the above, it is hopeless to think that cotton cultivation can be successfully maintained in any of these colonies.

COTTON SEED DISTRIBUTION IN EGYPT.

The method of distribution of cotton seed for planting as practised by the Government of Egypt, may be of interest to readers of this Journal who are cotton growers in other cotton-producing countries.

In addition to the cotton seed from the Government experiment stations and seed farms, which is limited in amount, large quantities of cotton seed are purchased from the ginneries, for distribution principally to the small cotton growers. The agricultural inspectors in the Provinces, with the assistance of the managers of the ginneries, are able to purchase for the government, the seed of specially good crop lots of cotton as this is passing through the gins, at a fixed percentage advance in price over the market value of commercial seed. Many of these crop lots of cotton have been reported upon by the agricultural inspectors just before they were picked This seed is bagged as it comes from the gins, and set aside for distribution in the following planting season.

Cotton growers who desire to obtain this government seed make application through regular official channels, stating that it is desired for planting by the purchaser, and not for sale; the applicant is required to show what area is to be planted with the amount of seed applied for, in order that no fraud may be practised.

In this way the small grower is able to procure seed from good crop lots at a reasonable price—seed which has been passed by a Government Inspector—the price being much lower than of seed sold by speculators, and the quality much better.

This system does not do anything to improve the strains of cotton, but it is of great value in preventing rapid deterioration in the varieties grown, since it results in the best seed being supplied to the small growers.

That this section of the work of the Ministry of Agriculture of Egypt is of great importance is shown by the development of the work, and the amount of seed distributed in this way in recent years.

The following figures are taken from an article by Mr. A. S. Merton, Director of the Commercial Section, Ministry of Agriculture, which was published in the *Agricultural Journal of Egypt*, Vol. VII, 1917, p. 154. The distribution of ordinary seed, such as that mentioned above, increased from 39,576 ardebs in 1912 to 81,321 ardebs in 1916. As an ardeb equals about 5½ bushels, weighing about 170 lb., these amounts are seen to be very considerable. The amount distributed in 1912 was 6,728,260 lb. and in 1916 it was 13,824,570 lb. This amount distributed in 1916 provided seed for planting about 244,000 acres.

SEA ISLAND COTTON PRODUCTION IN THE WEST INDIES.

The following figures show the quantity and estimated value of Sea Island cotton produced in the West Indies for the season, October 1, 1918 to September 30, 1918.

Colony.	Quantity in lb.	Estimated value calculated at 3*s* per ton. £.
Grenada	1,334	200
St. Vincent	329,115	49,367
Barbados.*	192,981	28,947
Montserrat	409,885	61,483
Antigua	59,950	8,993
St. Kitts	215,223	32,284
Nevis	258,286	38,743
Anguilla	46,654	6,998
British Virgin Islands	16,231	2,435
Trinidad*	450	68
	1,530,109	229,518

Besides the above, Grenada and St. Vincent also produced Marie Galante cotton, respectively, as follows: 241,524 lb. of an estimated value of £23,811, and 38,285 lb. valued approximately at £5,105; 2,335 lb. of Native cotton was also produced in the British Virgin Islands.

*The production of Barbados and Trinidad is taken from the return of exports for the season 1917-18.

SOUTH AFRICAN GRASSES FOR PAPER-MAKING.

Before the war the British Empire depended to a large extent on foreign countries for supplies of paper, and the wood-pulp from which paper is largely made, the chief source of supply of the latter being Scandinavia, though some was obtained from Newfoundland and Canada. It has long been realized that the tropical countries of the Empire possess in their coarse grasses abundant raw material for the manufacture of paper, and special attention has been given in India to the problem of utilizing these grasses in this way. Interest in this subject has extended to other countries of the Empire since the war began, but the scarcity of tonnage put serious difficulties in the way of importing either paper or pulp.

In South Africa a great deal of attention appears to have been given to the subject recently, and as a result a number of grasses have been sent to the Imperial Institute from South Africa for trial as paper materials. Summaries prepared from a selection of the reports on these grasses have since been published in the *Bulletin of the Imperial Institute*, Vol. XVI, No. 2, from which the following information is here abstracted.

JOHNSON GRASS.

A sample of Johnson grass (*Sorghum halepense*) was received in May 1917 It consisted of seed-like stems of pale green to straw tint, measuring from 7 to 8 feet in length; the stems were about $\frac{3}{8}$-inch in diameter at the base, tapering to about $\frac{1}{8}$-inch at the top, and bearing a flowering head. The stems were hollow, but had solid nodes at intervals of about 1 foot, each node bearing a sheathing leaf of pale green or straw colour often blotched with purple; the internodes were filled with soft white pith.

The grass gives a good yield of pulp, but is nevertheless not very promising as a paper-making material. The pulp contains a large amount of parenchyma derived from the pith, and this causes the paper to shrink greatly in drying, and renders it parchment-like. The pulp, moreover, does not bleach well.

It might be possible to utilize the grass for the manufacture of paper in South Africa, but if used by itself the pulp would probably be troublesome to work on account of the great shrinkage on drying, and as it does not bleach easily, its principal use would probably be for the manufacture of wrapping-papers. The nature of the pulp might, however, render it valuable for the production of special kinds of parchment-like papers, either by itself or in admixture with other fibrous materials.

THATCHING GRASS (DEK GRAS).

A sample of 'thatching grass', or 'Dek Gras', which was identified at Kew as *Andropogon Buchananii*, Stapf,, was received in June 1917.

It consisted of tapering stems, varying from 4 feet to 5 feet 6 inches in length, each bearing a flowering head. The stems were $\frac{1}{16}$ inch to $\frac{3}{16}$ inch in diameter at the base, with nodes at intervals of 10 to 15 inches throughout their length, a sheathing leaf springing from each node. The internodes are filled with soft pith.

The grass appears to be a promising material for the manufacture of paper in South Africa, as it gives a satisfactory yield of long-fibred pulp of good quality, suitable in the unbleached state for the manufacture of strong brown paper, or, after bleaching, for the manufacture of fairly good cream-coloured or white paper.

TAMBOOKIE GRASSES.

According to Dr. C. F. Juritz, (*South African Journal of Industries*. 1918, I, 516) the term 'tambookie' includes a large number of grasses belonging to the related genera *Cymbopogon* and *Andropogon*. In 1914 a sample of 'tambookie' grass, stated to be *Cymbopogon Nardus*, var. *validus*, was forwarded to the Imperial Institute in order to ascertain its value for paper-making. In June 1917 two further samples of distinct grasses were received, both described as tambookie grass. These samples were numbered 3 and 4. It was stated that No. 3 grows plentifully in dry open situations round Pretoria, and that No. 4 is abundant in damp situations.

Specimens of the two grasses were submitted to Kew for identification, with the result that No. 3 was pronounced to be *Andropogon Dregeamus*, Nees, and No. 4 *Andropogon auctus*, Stapf.

The two grasses were very similar in general appearance, consisting of long, tapering golden-yellow stems, measuring up to $\frac{3}{16}$ inch in diameter at the base, with nodes at intervals of about 10 inches, the intervals being filled with soft pith. Each node bore a sheathing leaf, and each stem was terminated by a long flowering head, which in sample No. 3 was mostly reddish in colour, and in No. 4 greenish. The length of the grass in sample No. 3 was 4 to 6 feet, and 5 to 7 feet in sample No. 4.

The present samples of tambookie grass both yielded pulp of good quality, and good brown papers could be made from them by treatment with small amounts of caustic soda (10 per cent. or probably less on a large scale). The pulp obtained with larger proportions of caustic soda could be readily bleached, and used for the manufacture of white paper of good quality.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial draws attention to various actions of moulds in the soil, and the influence they may be supposed to exert on soil fertility.

The first part of a report by the Entomologist on mosquito control in one of these islands will be found under Insect Notes on page 42.

An interesting note on the subject of the so-called 'root disease' of coco-nuts appears under Plant Diseases on page 46.

Camphor Trees in the West Indies—A Correction.

In the *Agricultural News*, December 28, 1918, it was stated that 'so far as is known at present no camphor tree growing in the West Indies produces anything but oil.' This was a mistake, as Mr. A. E. Collens, the Government Chemist of the Leeward Islands, has pointed out.

He refers to results obtained from trees growing in Jamaica, recorded in the *Journal of Chemical Industry*, 1912, which showed that camphor was obtained there from both green and dried leaves, twigs, and wood.

In Trinidad also, distillations made at the Government Laboratory from the produce of trees growing in the island, and reported on by Mr. J. H. Hart in October 1906, gave camphor from dried leaves and twigs.

Mr. Collens himself, as Officer-in-Charge of Special Investigations, Department of Agriculture, Trinidad, in 1916 undertook an investigation at the request of the Director of the Royal Botanic Gardens, Kew, on the yield of camphor and oil from the prunings of camphor trees at the Experiment Stations of St. Clair and Valsayn, and at the Royal Botanic Gardens at Trinidad. He obtained yields of from 1·2 to 1·5 per cent. camphor, and 0·2 to 0·3 per cent. oil from fresh green leaves, and 2·9 per cent. camphor from air-dried leaves a week old.

One tree in the Royal Botanic Gardens was found to yield oil only. A field examination of this tree showed several differences from the camphor-producing type: the stem and petioles were reddish and the leaves ovate. On being crushed, the leaves of this tree yielded a turpentine-like odour, somewhat similar to that of mango leaves.

An Experiment in Yam Cultivation.

In the cultivation of yams in the smaller West Indian islands, the practice of allowing the vines to run along the ground is usually followed, no stakes or supports being provided. It has, however, been considered that the crop would be benefited if such supports were supplied to the plants. Mr. W. Robson, the Curator of the Botanic Station, Montserrat, has recently carried out an experiment with regard to this question, and the results obtained by him for the one year's crop are very striking.

Twelve rows of yams, each 110 feet in length, of six different varieties of yams in duplicate, were planted in April 1918. Pen manure was applied to the whole plot, which was prepared by making banks 4 feet apart, and the yams planted on the banks, at a distance of 3 feet apart. Six rows, one of each variety, had stakes placed as supports for the vines; in the other six, the vines were allowed to run over the ground.

The crop was reaped in January 1919, with the result that in every case the staked plants gave a much larger yield than the unstaked plants of the same variety. The average yield of the six staked rows was calculated at 19,265lb. per acre, while that of the unstaked rows was only 10,716lb. This gain of the staked as compared with the unstaked plants was thus 79 per

cent., which, as Mr. Robson says, would amply pay the labour involved in staking.

In connexion with this experiment, Mr. Robson notes that from the time of planting the weather was dry until the end of August, when ample rains began and continued for the next two months. This indicates, he considers, seeing that the resulting crop was satisfactory in amount, that the months of September and October are the critical period for the development of the yam.

Toxic Principles of Coffee.

It has long been recognized that coffee possesses properties which cause inconvenience to some individuals, though others are able to use the beverage without any such inconvenience. For a long time it was suggested that it was the active alkaloid, caffeine, that was the cause of the symptoms complained of, but investigation has shown that these symptoms do not accord with those produced by caffeine, and other explanations are sought.

In a paper published in the *Transactions of the Kansas Academy of Science*, Professor L. E. Sayre reviews the question, and supports the idea that the toxic principle complained of is generated in the process of roasting the coffee berry. It is conjectured that certain pyridine derivates may be built up during the process of roasting, and that these may constitute the toxic agents.

As the result of these investigations, the hope is expressed that methods of heating or roasting coffee may be devised, whereby the formation of these objectionable bodies may be prevented, so that no coffee drinker may be exposed to the unpleasant effects which some experience.

Professor Sayre says that while coffee contains these toxic principles, it does not necessarily indicate, as some might suppose, that coffee is poisonous. Although some people are so constituted that they cannot use coffee, thousands of others use it without harmful effects, and even seem to receive benefit from its use. Therefore we should not condemn coffee simply because the toxic principle, which has always existed, has been identified more certainly. He adds, it might be said that it is very probable that this toxin can be removed. In fact, a process is now in use by which at least part of this toxic principle is expelled, and by further experimentation the process can be further improved.

The Effect of Liming on Crop Yields.

A series of experiments in cylinders on the effect of liming on crop yields in conjunction with fertilizers has been undertaken at the New Jersey Agricultural Experiment Station for twenty years. The results are recorded in a paper by J. G. Lipman and A. W. Blair, published in *Soil Science*, August 1918.

Four series of cylinders were annually treated with applications of acid phosphate and muriate of potash equivalent to 640 and 320 lb. per acre, respectively. In addition, nitrogenous fertilizers have been applied annually as follows: to the first series, nitrate of soda at the rate of 160 lb. per acre; to the second, nitrate of soda at the rate of 320 lb. per acre; to the third, ammonium sulphate equivalent to 320 lb. of nitrate of soda per acre; and to the fourth, dried blood equivalent to 320 lb. of nitrate of soda per acre. All the cylinders received a generous application of ground limestone when the experiments were started. Each series was in triplicate, and after the first period of ten years no further lime was given to lot A, while lots B and C continued to receive a generous application once in the five-crop rotation, and in addition, lot C was put under a leguminous crop as a green manure twice in each rotation.

The results at the end of twenty years show that where commercial fertilizer alone is used as a source of plant food, in amounts corresponding to those employed in the experiments, there would be a marked accumulation of soil acidity, and a very marked improvement in plant growth after the application of adequate quantities of lime. Lot A gave very inferior yields to the others, while lot C was distinctly superior. The continued use therefore of acid phosphate, muriate of potash, nitrate of soda, sulphate of ammonia, and dried blood is bound to lead, sooner or later, to an unsatisfactory soil reaction, and to the need of generous applications of lime.

The writers lay stress on the importance of systematic and adequate liming of land, the production of which it is sought to bring up to constantly higher levels, by the generous use of commercial fertilizers.

Emphasis is also laid on the importance of introducing leguminous crops in the rotation at frequent intervals for the purpose of increasing the supply of available nitrogen, and also of maintaining a good supply of organic matter.

Vitality of Acacia Seeds.

Some seeds possess an extraordinary power of keeping their vitality under the most adverse conditions. This is notably the case with seeds which possess a very hard shell or testa. Studies on the vitality of the seeds of *Acacia farnesiana*, well known in the West Indies, the pods of which are of some value in tanning, have been undertaken by R. H. Cambage in New South Wales. A note on the results appears in the *Experiment Station Record*, November 15, 1918, which shows that the seeds of this plant seem to be able to stand any kind of treatment, and yet be able to germinate.

A seed of *A. farnesiana* was soaked for 405 days in sea-water, and then planted. After five weeks it was examined, placed in boiling water, and replanted. It was re-examined after nine weeks, again placed in boiling water, and once more planted, and after five weeks it finally sprouted. Another seed sprouted after having been in the soil twenty-three months. It is stated that the softening of the hard coat of the seeds, requisite to sprouting, is often accomplished in the natural surroundings of the plant by bush fires. Otherwise the seeds may remain dormant in the soil for years. They may also be transported by water for thousands of miles, and then germinate.

INSECT NOTES.

SUGGESTIONS FOR MOSQUITO CONTROL IN A WEST INDIAN ISLAND.

[*Notes from a report to the Imperial Commissioner of Agriculture by the Entomologist of this Department after a visit to Grenada.*]

At the request of the proprietor of a certain estate I went to see what advice could be offered in connexion with mosquito control. The managers and their families on this estate have suffered to such an extent from malaria that the proprietor desires to take such steps as may be necessary to render the place free from this disease, and to protect the managers and their families from attacks by the malaria mosquitoes. I did not collect mosquitoes, but merely went over the place with a view to advising as to mosquito control.

Mosquito control with a view to the preventing of malaria falls under two general heads :—

(a) Prevention of attacks of mosquitoes.

(b) Elimination of mosquitoes from the vicinity of dwelling places.

In discussing the situation I recommended mosquito-proofing the manager's house with suitable wire-gauze. For this purpose brass or copper wire-gauze, 20 mesh, would be most satisfactory.

The manager's house in question might be easily screened. In order for such screening to be effective, all doors, windows, ventilators, and similar openings should be screened, and any cracks, knot holes in the lumber, or similar accidental apertures should be carefully covered. Screen doors should be provided with springs for closing them immediately, and with a spring catch to fasten and hold them shut. The kitchen should be screened also, with a screen door between the kitchen and other parts of the house.

The anopheles mosquito flies from just before sunset to about sunrise, and during this time every precaution should be taken to prevent the entrance of mosquitoes into the house, and to prevent mosquitoes from biting. The use of mosquito nets for protection against mosquito bites during sleep is well understood in the West Indies. Mosquito nets should not be discarded even after the dwelling house has been 'mosquito proofed', until it is found that no mosquitoes are gaining access to the sleeping room.

These mosquitoes rest during the day; in the house they seek out dark corners and obscure patches on walls and ceilings, where they remain motionless during the day. They hide behind the curtains or clothes, and get into closets and wardrobes, the drawers of bureaus, under tables, and, in fact, in any spot sheltered from light and currents of air.

The interiors of rooms, where the attempt is being made to get rid of mosquitoes, should be painted or washed in light colours—as light as possible without making the effect too glary for the comfort of those who occupy them. Curtains also, and other hangings should be dispensed with as far as possible, and clothes and all wearing apparel should be folded and put away during the day, or, if hung up, should be placed in bright light, and if possible in a draught of air.

The object of a light paint or wash in the room is to make it easy to capture any mosquitoes which may have gained access during the night, and which have taken refuge for the day in shady spots on the walls or ceilings. The mosquitoes being dark in colour are more easily seen on a light-coloured surface. The reason for hanging clothing in the light, and in a draught of air is that the mosquitoes seek secluded places in the daytime, and on the advent of daylight move away from the light and airy parts of the room to the more shady and still retreats.

If wardrobes, presses, closets, and chests of drawers are found to harbour mosquitoes during the day, they should be examined, and the mosquitoes captured and killed. Mosquitoes resting on the walls may be killed by means of the ordinary fly 'swatter,' a piece of wire-mesh about 4 by 5 inches in size, fixed to a slender wooden handle 16 to 18 inches long. The ordinary insect net, made by fixing a muslin bag on a wire ring about 10 inches in diameter, attached to a light wooden handle 4 feet or so in length, may be found useful for catching mosquitoes in the house.

Mosquitoes resting on the ceiling may be captured in the following manner. A shallow tin or glass receptacle $\frac{1}{2}$ to $\frac{3}{4}$ inch in depth is fixed at the end of a light pole, of sufficient length that the ceiling may be reached with it. A small amount of kerosene oil, or oil and water, is put into this receptacle, which is carefully raised up and placed over (or under) the mosquito. The insect attempts to fly, and is caught and killed in the oil.

There are many repellent oils and mixtures which may be rubbed on the hand, face, and exposed parts, which prevent to some extent the attacks of mosquitoes. They are most likely to be of use in situations where mosquito nets are not available, or for application during the evening before retiring for the night. They cannot be expected to take the place of good mosquito nets, but in the case of nets in a bad state of repair they may be useful. Spirits of camphor, citronella oil, oil of lavender, oil of pennyroyal, oil of tar, cassia oil, essential oil of oranges, and many other aromatic substances are all useful in this connexion. An objection to all these is that they evaporate more or less rapidly, and often only give protection for a part of the night. Several mixtures are strongly recommended, and some of these are said to retain their repellent qualities for a longer time than any of these substances when used alone. A few of these mixtures are indicated herewith :—

(a)	Oil of citronella	1 oz.
	Spirits of camphor	1 oz.
	Oil of cedar	$\frac{1}{2}$ oz.

Ordinarily a few drops of this mixture on a towel hung at the head of the bed will be sufficient to repel mosquitoes from the face of the sleeper, but if mosquitoes are very abundant it may he necessary to rub a few drops over the skin of the hands and face.

(b)	Castor oil	1 oz.
	Alcohol	1 oz.
	Oil of lavender	1 oz.

This mixture has been prepared to avoid the use of citronella, which is very objectionable to many persons.

(c)	Oil of citronella	1 oz.
	Liquid vaseline	4 oz.

The citronella in this ointment may be replaced by other oils if so desired.

H. A. B.

(*To be continued.*)

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. The following plants were distributed during the month of December: lime plants, 512; economic, 436; ornamental, 7; cassava cuttings, 14,000; sweet potato cuttings, 20,000; vegetable seeds, 23 packets. The Agricultural Superintendent states that 46 casks of concentrated lime juice and 10 cases of distilled lime oil were shipped from the Government Lime Juice Factory during the month. The total shipments of the present crop to date were 127 casks concentrated lime juice, and 2,804 lb. distilled lime oil. The rainfall recorded at the Botanic Gardens, Castries, for the month was 6·67 inches; at the Agricultural and Botanic Station, Choiseul, the record was 2·79 inches.

MONTSERRAT. Weather conditions were satisfactory for crops in the Experiment Stations during the month of January, writes Mr. Robson, the Curator. The yam plot was reaped with fairly good results, showing the advantage of staking yams. Plant distribution was as follows: lime plants, 1,400; bay plants, 800; cane cuttings, 1,550; grafted mangoes, 3; varieties of beans, 12 packets; bread-and-cheese seed, 7 lb. For the second season, trials made of growing two cotton plants in a hole as compared with one, showed a gain of 20 per cent. in crop by the former method.

The destruction of all old cotton plants by January 31 is enforced by law; two areas, limited in extent, have been exempted until the middle of February. Suggestions have been made for the appointment of an Inspector of Cotton to carry out the provisions of the Ordinance dealing with this crop. Early in the month 1,000 bales of cotton of the 1918 crop were shipped. Observations during the month showed that the cotton stainer (*Dysdercus andreae*) predominated to the extent of 100 to 1 of *D. delauneyi*. The latter seemed to have been generally distributed, but few in numbers. The destruction of silk-cotton trees was commenced, while that of the mahoe was completed during the month. Waning interest in the sugar industry is evidenced by the fact that the exports for 1918 totalled only 41 tons of sugar, as compared with 417 tons exported in 1916.

Mr. S. C. Harland, B.Sc., Assistant for Cotton Research on the staff of the Imperial Department, visited the island from December 30 to January 21, 1919. At a meeting of the Agricultural Society held on January 8, at which His Honour the Commissioner presided, Mr. Harland delivered an address on the campaign in St. Vincent against the food-plants of the cotton stainer.

The rainfall recorded at Grove Station to January 30 was 4·20 inches. No heavy rains were experienced except in one district, where 5½ inches fell in two hours, with a very small precipitation in other parts of the island.

NEVIS. Mr. W. I. Howell reports reaping operations in the experiment stations during the mouth of December. Regarding staple crops, he states that the old cane crop is ripening, and reaping operations will begin early in February. Preparation for next season's crop is progressing rapidly, and there will be a great increase in the acreage put under canes. The cotton crop is practically all reaped, except in a few places where a second picking is expected. The old cotton plants in some places are being cut down, and preparation for the next crop will soon begin. The yam and potato crops were being reaped, with fairly good returns. The rainfall for the month was 2·28 inches; for the year (1918), 53·98 inches.

AGRICULTURE IN BARBADOS.

On January 10 there was a slight change in the dry weather with which the new year began. To January 25 the total rainfall for the month is just over an inch in the drier districts of the island, and between 2 and 2½ inches in the hilly parishes.

As during the past few years, the manuring of the young crop is yet some way from completion, and there is still some tillage to be done. This unsatisfactory state of affairs would be greatly helped by the planting of a smaller acreage in rested land. The ruling idea at present is to force every field, but, in spite of high prices, it will not prove as advantageous as the production of crops under a system of rotation.

Where grinding is in progress it is principally the borders of fields only that are being cut. The density of the juice shows that the canes are by no means ripe. On one or two estates in the black soil we have heard that the density is 10, but 8 is the report we have received from others. A few factories in the black soil have commenced since the date of our last report, but grinding will not be regularly started before February. The tonnage on one estate in Christ Church varies between 28 and 38. This is satisfactory, and we anticipate a general return in advance of both 1917 and 1918, but less than the yield in 1916.

The richness of the juice from the B.H. 10 (12) is expected to make the supply of fuel easier on estates where there is no green megass furnace.

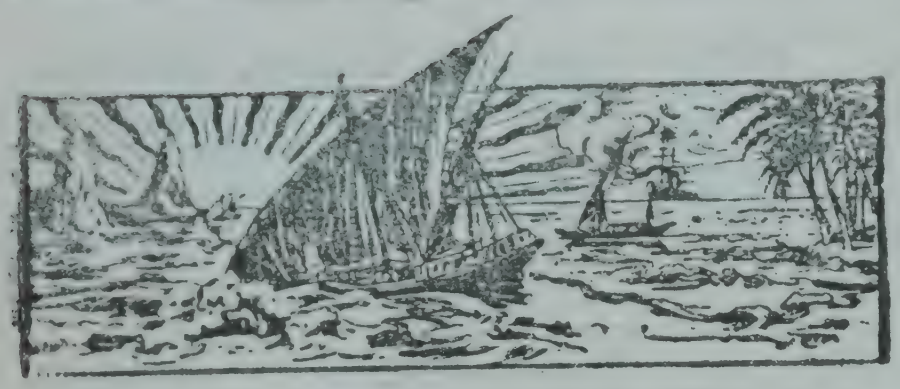
The small engagements of syrups made early in the month have been generally fulfilled, and buyers are now awaiting instructions from Canada. There is some talk of the Canadian market being able to obtain a supply of syrup from Cuba and Porto Rico, and it is stated that this contingency is causing the delay in the permanent opening of the market here. Whatever may or may not be happening on this point, there is one thing that we should be most careful about. We should see to it that a pure and well prepared article is placed on the Canadian market. It is known that the flavour and quality of genuine Barbados syrup are excellent. Whenever pure syrup is not exported the package should be so marked, in order that buyers in the great Dominion should not be deceived.

The cotton crop in the seaboard districts has fallen below expectations. The drought is the main cause of this.

The yam crop has been somewhat irregular. In some districts the return has been good, in others moderate. This vegetable is now being sold by estates at $1 per 100 lb. Eddoes are plentiful. Potatoes are scarce. This was to be expected after the reaping of the spring crop. (The Barbados *Agricultural Reporter*, January 25, 1919.)

About Cuba.—Writing in the *Cuba Review* for December 1918, Mr. W. H. Morales states that Cuba's foreign trade for the fiscal year ending June 30, 1918, amounted approximately to $670,000,000 ($370,000,000 exports, and $300,000,000 imports) as compared with $141,002,921 for 1902-3, the first year of the Cuban Republic.

The sugar crop of 1917-18, fully harvested at October 25, amounted to 3,446,083 tons, which at 4·60, the price fixed last year by the International Sugar Committee, represents $400,000,000 with by-products approximately. Cuba is, in normal times, one of the highest priced countries of the world, and under present conditions, due to the European war, the cost of living is enormous.



GLEANINGS.

According to the *Cyprus Agricultural Journal*, July 1918, sparrows have been doing so much damage in the corn-growing localities of the island that school children are encouraged to collect the eggs for destruction, by receiving a small payment for them from neigbouring police stations.

The marked development of Tobago during the last twenty years is shown by a comparison between the value of the exports in 1897 and those of 1916 and 1917. In 1897 the exports were of the value of £6,770, rising in 1916 to £79,864, though falling again in 1917 to £55,825. (The *Bulletin of the Department of Agriculture, Trinidad and Tobago*, Vol. XVII, Part 3.)

The Experiment Station Committee, Hawaii, is informed, according to the Committee's report referred to in the *Louisiana Planter*, December 28, 1918, that the new leaf-hopper parasite obtained in Formosa is spreading rapidly throughout the cane plantations, and that there is good reason for believing that it will prove of great assistance in checking the further spread of the pest.

The sugar production in Peru, amounting to 300,000 tons, is some 30,000 tons in excess of the returns for 1917. The sugar in use in Peru and Chile is all refined sugar, which, due to existing monopoly, has reached notorious prices. Chile takes 50,000 tons, Great Britain, 200,000 tons, Peru and Bolivia absorbing the remainder. (The *Weekly Bulletin*, Department of Trade and Commerce, Canada, December 23, 1918.)

The production of sweet potatoes in the United States in 1917 was estimated to be a little over 87,000,000 bushels. Of this quantity probably about 50,000,000 to 55,000,000 bushels were placed in storage. It is estimated, however, that only about 33,000,000 to 38,000,000 bushels of the stored crop were actually consumed; the remainder were destroyed by storage rot organisms before they reached the market. (*Journal of Agricultural Research*, November 11, 1918.)

The cultivation of pine-apples has become one of the most important branches of fruit culture in tropical parts of Australia. The excellence of the pines, and the suitability of the climate have made the Queensland pine-apple quite famous. As a commercial undertaking, growing pine-apples in Queensland is very profitable when due consideration is given to the requirements of the crop. (The *Colonizer*, October 1918.)

At the beginning of October the sugar-cane crop in Egypt presented a good appearance, but owing to the scarcity and high prices of fertilizers the expected yield is not likely to be realized. It is stated that in the neighbourhood of towns the crop is being cut for consumption as an alternative foodstuff in these days of high-priced foods. (The *Louisiana Planter*, December 14, 1918.)

The area planted with tea in Ceylon approximates to 400,000 acres, mainly planted during the past thirty years. The estates vary in size from 100 to about 2,500 acres, and are chiefly under European supervision, and worked with Tamil labour from Southern India. The average outturn for Ceylon tea ranges between 400 lb. to 500 lb. of made tea per acre, but well cultivated estates yield more heavily. (*Colonial Reports*—Annual, No. 971.)

A copy of the regulations and syllabus of the School of Agriculture attached to the Department of Agriculture, Mauritius, shows that three courses of instruction are planned, each lasting for a period of three years, and each leading to a Diploma of the Department of Agriculture, the choice of the course being in the discretion of each student. The courses are: (a) agricultural chemistry, (b) general agricultural science, (c) economic biology. Details of the work in each of these courses are given in the syllabus.

Honduras tobacco has always enjoyed a pre-eminent position in the estimation of Central American tobacco smokers. The amount and value of tobacco exports through the seaports of Honduras for the years 1915 and 1916, respectively, were 56,800 lb. worth $6,810, and 89,025 lb. worth $19,610. Honduras tobacco after being manufactured into cigars and cigarettes is also exported in considerable quantity to South America, particularly Peru, and to Europe. The volume of this business amounts to many thousand dollars annually. (The *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, July 1918.)

The *Weekly Statistical Sugar Trade Journal*, January 16, 1919, includes the annual report of the year ended September 30, 1918, of the Cuba Sugar-cane Corporation. Some of the figures given are interesting as compared with results obtained in other central factories of the smaller islands. The average percentage of sucrose of the seventeen plantations during three crops was as follows: 1915-16, 13·87 per cent.; 1916-17, 13·00 per cent.; 1917-18, 13·31 per cent. The total losses in milling and manufacture during the same three crops are recorded as: 1915-16, 3·07 per cent.; 1916-17, 2·67 per cent.; 1917-18, 2·36 per cent. It is interesting to note that these factories dealt with 4,574,782 tons of cane for the last crop.

In the Monthly Produce Report printed in the *Proceedings of the Agricultural Society of Trinidad and Tobago*, November 1918, it is stated that the reaping of the new sugar crop will probably begin somewhat earlier than usual. Crop prospects continue favourable, on the whole, and while some estates have suffered from frog-hopper attacks, others have been practically immune this year. Among the latter is one, formerly a heavy sufferer, on which implemental tillage has been introduced, and a system of intensive cultivation employed. It is asserted that the absence of the frog-hopper is due to this improved cultivation, and that the pest cannot exist under the new conditions of light and air to which it is now exposed.

ST. VINCENT: REPORT ON THE AGRICULTURAL DEPARTMENT, 1917-18.

This report, which has just been issued, shows that the officers of the Agricultural Department in St. Vincent are continuing to carry out good work in many lines. It also shows that the agricultural community are operating with them in striving after steady progress.

The care taken of the beautiful historic Botanic Garden is worth commendation, and, as usual, several new and interesting plants have been introduced into it.

A detailed report on manurial experiments with cotton and arrowroot shows some striking results. With regard to cotton, the observation made in 1916, namely that under the conditions of cotton cultivation in St. Vincent, an application of potash alone is more beneficial than a combination of potash and phosphate has been borne out by results in 1917. It is also pointed out that an application of cotton-seed meal at the rate of 600 lb. per acre, is insufficient to meet the nutritive requirement of the plants when grown on the same land for a number of years. Cotton planters are warned that signs of potash deficiency are very apparent on many lands of the island, and that adequate provision for the keeping up of soil fertility is vital, if cotton growing is to remain remunerative. As with cotton, the results of manurial experiments with arrowroot tend to show that the chief element which needs to be supplied in St. Vincent is potassium.

There have been interesting plant breeding experiments carried out by the Department during the year under report, especially on cowpeas and bonavist beans, by which improved varieties seem to be in the way of being permanently fixed.

It is evident that the measures adopted in the latter part of 1916 and the early part 1917 for the destruction of silk-cotton (*Eriodendron anfractuosum*) and 'John Bull' (*Thespesia populnea*) trees, and perennial wild cotton stalks, have led to complete control of the cotton stainer, which threatened to destroy the cotton industry of St. Vincent. The Agricultural Superintendent states that it would be difficult, and perhaps impossible, to arrive at even an approximate estimate of the increased yield and value of the 1917-18 Sea Island cotton crop of St. Vincent, attributable to these measures, but it is estimated that, in value, cotton growers have benefited thereby to the extent of several thousand pounds sterling. On another page of this issue the regulations in force for this purpose in St. Vincent are reproduced. The Government ginnery continues to work with satisfactory results. The oil expressing department is to be noted. St. Vincent Sea Island cotton continues to hold its high place in the English market.

The output of both arrowroot and cassava starches was well maintained, and high prices were obtained for both these products. The manufacture of farine from cassava roots was much increased, and large supplies of this nutritious farinaceous food were consumed locally as a substitute for wheat flour, owing to the short supplies obtained of the latter article. The output of arrowroot starch for the year 1917 was 4,737,548 lb., valued at £40,296, and of cassava starch, 218,390 lb., valued at £1,420.

Sugar-cane cultivation has made still further progress, but, with the increased attention again being devoted to cotton, it is doubtful whether this cultivation will attain much greater development. The total exports of sugar and sugar products for 1917 were valued at £14,686, whereas in 1913 they were only valued at £173.

A very satisfactory feature in the agricultural progress of St. Vincent is the much greater extent to which Indian corn is planted and utilized. This is largely due to the successful operation of the Government granary, which dealt during the 1917-18 crop with 295,908 lb. of 'wet' grain—more than double the amount dealt with in the previous season. Excellent results were obtained by kiln-drying corn and storing it. A large portion of this was converted into corn meal for local consumption at a period when local food products were comparatively scarce, and imports of foodstuffs restricted. Besides being able thus to supply all local demands, no less than 2,855 bushels of kiln-dried corn were exported, 55 tons of this having been shipped to England, where it was sold at satisfactory prices. The Government granary in St. Vincent is worked in such a satisfactory manner that enquiries concerning its working and arrangement have been received from several other West Indian colonies.

Among minor industries, the cultivation of ground nuts continues to receive attention, and a considerable export is maintained to other West Indian islands, the total for the year 1917 being 14,421 bushels. There has been, however, a large diminution in the cultivation of pigeon and black-eye peas. The cause of this was the fear of infecting cotton with bush bugs. When it was found that the green bug (*Nezara viridula*), which attacks peas as well as cotton, transmits internal boll disease, planters, in order to avoid the possibility of damage to their valuable cotton crop, refrained from planting peas to a large extent; hence the exports show a considerable decline as compared with those of the previous year.

It is noticed that large areas of coco-nut trees are now coming into bearing. So far the practice has been to ship to Trinidad the surplus nuts and any copra made. The question, however, is now becoming pressing as to whether it would not be better to erect oil mills locally for dealing with coco-nut products, chiefly because of the desirability of retaining the residual meal in the island, as food for stock, or as manure.

Agricultural co-operation continues to flourish in St. Vincent, the number of agricultural co-operative credit societies at present in operation being twenty-one, with a membership of 925. Besides this, the co-operative purchase of cotton and corn at the Government ginnery and granary probably does the largest business in this way of any institution of its kind in the West Indies.

Throughout the year under report the meteorological conditions in St. Vincent were normal, and advantageous to the various crops. The rainfall recorded at the Botanic Garden was 102·35 inches for the year 1917, as compared with 137·63 inches for the previous year.

It is satisfactory to note from the Government Veterinary Surgeon's report that St. Vincent continues to remain free from anthrax.

PLANT DISEASES.

THE ROOT DISEASE OR RED RING DISEASE OF COCO-NUT PALMS.

In connexion with the report on the above subject which appeared in this Journal on page 298 of Volume XVII (Dec. 14, 1918), it is desirable to take an early opportunity of summarizing the [illegible] of later investigation, in view of the modifications in [illegible] method of handling diseased trees which arise from fuller [illegible]owledge.

During the recent visit of the writer to Trinidad, fairly frequent opportunities arose of examining trees affected with this disease. In all cases the presence of nematode worms was general in the diseased roots at all stages, exactly as in the Grenada cases previously reported on. As in Grenada, however, no gravid females, eggs, or immature worms were found in the root tissues, and it seemed evident that breeding was taking place elsewhere.

When release from other duties permitted of more detailed investigation being made, it was found, on uncovering the roots of a failing tree, that infestation was in general proceeding outwards from the base, not, as had been expected, inwards from the surrounding soil. The red cylinder in the stem, which is the most characteristic feature of the disease, was then examined, and was found to be throughout its extent the breeding ground of the worm. The yellowed and reddened cortical tissues which make up this cylinder are infected with worms (in all stages) and their eggs. The upper extremity of the discoloured tissue shows small cavities, similarly infested, just beginning; and sections in this region reveal the eggs inserted in living tissue, this at a height in the first case examined of some 4 feet 6 inches from the ground, and about equidistant in cross section from the younger leaf bases and the centre of the stem.

The base of the leaf-stalks of young and healthy looking leaves was also found to be infested in clearly defined yellowed areas, the infection apparently proceeding (though the point was not definitely decided) from the red cylinder in the stem. This provides a rational explanation, previously lacking, of the association of a localized wet rot of the leaf base with the disease. Simple explanations now suggest themselves, moreover, for the fact that in the great majority of cases trees which have passed the first years of bearing escape the disease.

There is little doubt, from the successive dying of trees in groups, that the disease spreads from tree to tree. It is urgently required that the mode of infection should be discovered. Meanwhile there is indicated the desirability of the destruction of the trees immediately they show definite signs of infection, and the statement previously made, that the disposal of the stem is of no consequence, must be completely withdrawn. It is now shown to be even more desirable to destroy the stem and the leaf bases than the roots themselves.

At the same time caution must be exercised in marking trees for destruction, as the early stages of this disease are hardly distinguishable from the effects of an unthrifty condition. The latter, however, tends to persist without much alteration, whereas the cases of disease progress steadily and somewhat rapidly towards inevitable death.

It may further be pointed out that the designation 'root disease', always undesirably vague, becomes, in the light of this evidence, definitely inappropriate. It is suggested that the name 'red ring disease', indicating the most important diagnostic feature, would be more suitable.

W. N.

PAPER YARN.

The great progress that has been made in the use of wood cellulose for textile purposes in the last few years is the subject of an article in *The Times Trade Supplement*, December 1918. It would appear that paper yarn is likely to be a formidable competitor of vegetable yarns, such as jute, hemp, cotton, which have hitherto been almost the only source of yarns used in the production of woven fabrics.

The development of the paper yarn industry in Germany to remedy the deficiency in the supplies of the familiar fibre textiles, more particularly of wool, cotton, and jute, is one which should command close study and attention. There is every indication that paper textiles are destined to play a prominent part in the future.

Germany is sparing no effort to exploit her paper yarn industry to the utmost. Economic conditions, and the uncertainty of the future are responsible for this action.

The utilization of paper yarn as a raw material has enabled them to keep their factories going. A year ago this industry extended employment to 13,000 people, while the daily output of paper yarn was 100,000 kilos. To meet this output, 2,000,000 cubic metres of wood a year are requisite.

In November 1916, the German Raw Material Department estimated that the paper yarn requirements for the army would be 1,000 wagon-loads per month. It was demanded for the manufacture of sand bags, straw, and forage sacks, the provision of canvas tents, and for a wide variety of other purposes for which it is eminently adapted. This quantity did not completely satisfy the army's needs. When blended with other textiles, such as cotton and hemp, and in varying proportions, the grade and strength of the yarn are proportionately improved. It is the vast field awaiting exploitation by the paper-yarn interests which invests this development with such significance.

It is generally believed that this product is of German origin, but this is not the case.

The British inventions dealing with this product command superiority over the German essentially by reason of increased spinning speed and reduced waste. It was less efficiency in regard to these two factors which reacted against the success of the Teuton invention for five years. As a matter of fact the spinning speed attained with the British machinery compares very favourably with that generally recorded in connexion with cotton and wool, so that the process is able to compete with the fibre materials. The variety of fabrics which may be woven either directly with paper yarn or in association with fibres is very wide, including carpets, ropes, sacks of all kinds, linoleum without the assistance of either cork or linseed oil, braiding, belting, webbing, wall coverings, and even a substitute for three-ply boarding, as well as twines and strings.

The many products manufactured by the British and German machinery have been submitted to searching comparison by several official departments, while the Allied Governments have also investigated the process. The reports have proved highly favourable, with the results that paper-woven fabrics are now being widely used by the War Office and other branches of the various services as a substitute for materials formerly made from jute and hemp. To recite all the varied applications is unnecessary, but it may be said that sacks are now being made from paper to carry cement, sand, salt, borax, fertilizers, and other kindred materials, as well as for the packing of foodstuffs—grain, potatoes, flour, coffee, sugar, and so on. So far as munitions are concerned, it is being used for explosives, machine gun belting, camouflage material, as well as for webbing and similar articles.

The fact that paper yarn can be rendered both waterproof and fireproof at an infinitesimal cost is a distinct recommendation in its favour. Its selection for machine-gun belting has effected considerable financial economy, while this application also serves to emphasize its superiority to fibre textiles very convincingly. The objection against belting made from the last-named is its liability to shrink when wet, and to stretch when dry. The paper substitute remains totally unaffected by any fluctuations of weather conditions. In point of cost there is a remarkable divergence, the fibre belt costing from three to four times as much as the paper substitute.

The material is so perfect in all essential characteristics that it may be washed, boiled, and ironed without apprehension. This renders it an excellent substitute for linen and cotton for many domestic purposes. So far as dress materials are concerned, it possesses distinct shortcomings, which fertility of thought has not yet succeeded in eliminating.

So far as Great Britain is concerned, the manufacturers assert that the future for the paper textiles is assured. The industry has become firmly and solidly established.

It is asserted that the paper textile industry has nothing to fear from the competition of wool, cotton, jute, and hemp when normal conditions return. Paper textiles must inevitably hold their own within the field they have secured, from the mere fact that they show an advantage in regard to price, coupled with the recognition of the undoubted circumstance, that in many instances the resultant articles are superior to those wrought from fibre textiles. Consequently the industry is certain to undergo rapid and extensive expansion.

At the moment Great Britain is suffering from restricted imports of paper, but the Government attach such importance to the new and young industry that they conceded a special license for the manufacturers to import further quantities of paper to meet their requirements and increasing activities. The official and civilian recognition of the paper yarn industry must represent a potential contribution to British industrial and commercial strength, although it is likely to add to the complexities of the paper situation as a whole, more particularly as further applications for the yarn are being discovered and proved with each passing week. But the most gratifying feature is the knowledge that the full exploitation of this industry is not being left entirely to the enemy, who is thus destined to encounter severe competition in the neutral markets where he will essay to develop this new line of textile articles to the utmost.

A CURIOUS LOCAL EPIDEMIC.

A certain epidemic broke out in the earlier months of 1917 among the labourers on some sugar estates in Jamaica. This epedimic was invested by Dr. H. H. Scott, Government Bacteriologist of that island. He has recorded the results of his investigation in a paper in the *Annals of Tropical Medicine and Parasitology*, October 31, 1918.

It seems that while the epidemic was in progress the disease was spoken of as the 'Spanish Town epidemic' because the majority of cases occurred in the neighbourhood of Spanish Town, the ancient capital of Jamaica. Dr. Scott thinks, however, that the condition is also met with in other parts of the island, and that the Sqanish Town epidemic represents the acute stage of a disease which has for a long time been designated wrongly in Jamaica as 'peripheral neuritis'.

The onset of the disease in each case was sudden, the patients nearly all of them adults, being attacked while at work and apparently in good health.

All of those attacked during the epidemic were of the peasant class, that is, natives who worked as labourers on the sugar estates, or who in rare instances had small holdings of their own. Males and females were equally affected. The epidemic started during the cutting and carrying of the cane crop, and the reporting of fresh cases ceased almost abruptly as soon as the crop was finished.

In practically every instance the first symptom complained of was a sensation of itching in the eyes, followed in a few days by serious inflammation of the conjunctiva. Within four days to a week after the onset of the eye symptoms, a burning sensation in the mouth was complained of, followed by inflammation of the mucous membrane of the lips and cheeks. About fourteen days after the first onset further symptoms declared themselves, and the cases may be placed in one of two categories: (1) those with diarrhœa and intestinal symptoms, of whom some died in a few days apparently from exhaustion, while others slowly recovered; (2) those with nervous symptoms. In these cases a sensation of numbness and tingling, starting in the toes and soles of the feet, was complained of. This numbness spreads up the legs, and in the course of three or four days walking was impossible. In the worst cases there was some difficulty of speech, due, as the patients described it to 'numbness of the tongue.' In those cases which terminated fatally after a considerable period, there was a marked general emaciation. The last stage of the fatal nervous cases was always the same. About forty-eight to seventy-two hours before death combined inanition, emaciation, and diarrhœa brought about the fatal issue.

Dr Scott does not consider that the disease is either pellagra or beri-beri or any 'deficiency disease'. Although he has not found any definite toxin which, introduced in a pure state, will produce the symptoms of this disease, he leans to the conclusion that it is so caused. The curious point is that the epidemic had some apparent relation to the fact that those who were attacked were working in cane fields, and that during this period of cutting and carrying canes the labourers live almost exclusively on the raw canes.

The Doctor concludes his interesting paper by saying that, in the present state of knowledge, all that he is justified in concluding is that the history, course, and *post-mortem* findings in the Spanish Town epidemic, and in the so-called peripheral neuritis cases indicate that the condition is that of a 'central neuritis' due to some toxin, possibly microbial, more probably not, affecting mainly workers on sugar estates, and possibly due to the growth of some fungus or parasite upon the suckers, tops, or leaves of the cane.

Attention is drawn to the fact that the cane tops, which are cut or broken off, are covered with small hairs which are very irritating, and which may have set up the original inflammation of eyes and mouth.

In the November issue of the *Proceedings of the Agricultural Society of Trinidad and Tobago*, there is printed some correspondence between His Excellency the Governor of Trinidad, the Secretary of State for the Colonies, and the Imperial Commissioner of Agriculture for the West Indies on the subject of the reorganization of the Agricultural Department, and the Board of Agriculture, Trinidad, together with a draft Ordinance to be submitted to the Legislature relating to the Agricultural Society.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, January 9.

BALATA—Venezuelan Block, no quotations; Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 90/-; Grenada, 85/-; Jamaica, no quotations.
COPRA—£46.
HONEY—West Indian, no quotations.
LIME JUICE—Raw, 3/- to 3/6; concentrated, no quotations.
PIMENTO—No quotations.
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD December 1918.

BAY OIL—Firm, at 22*s*; Lime Oil—Slow, at 6*s*. for West Indian distilled, and 16*s*. to 17*s*. for hand pressed; Orange Oil—West Indian commands 8*s*. to 8*s*. 6*d* per lb.

Barbados.—Messrs. T. S. GARRAWAY & Co., January 30.

ARROWROOT—$10·00 per 100 lb.
CACAO—$17·13 per 100 lb.
COCO-NUTS—$32·50 husked nuts.
HAY—No quotations.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations
SUGAR—Dark Crystals, $5·50

Trinidad.—Messrs GORDON, GRANT & Co., December 9.

CACAO—Venezuelan, $16·75 to $17·25; Trinidad, $16·50 to $17·00.
COCO-NUT OIL—$1·51 per gallon.
COFFEE—Venezuelan, 13c. to 14c. per lb.
COPRA—$7·25 per 100 lb.
DHAL—$10·00 per bag.
ONIONS—$8·00 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $5·60 per 100 lb.
RICE—Yellow, $14·00 to $14·50; White, $9·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs GILLESPIE BROS. & Co., January 11.

CACAO—Caracas, 17c. to 17½c.; Grenada, 15½c. to 16c. Trinidad, 16½c. to 16¾c.; Jamaica, 15c.
COCO-NUTS—Jamaica selects, $52·00; Trinidad $53·00 culls, $27·00 to $28·00 per M.
COFFEE—Jamaica, 18½c. to 21½c. per lb.
GINGER—18c. to 20c. per lb.
GOAT SKINS—Market unsettled.
GRAPE FRUIT—Jamaica, $3·50 to $4·00.
LIMES—Nominal $7·00.
MACE—43c. to 45c. per lb.
NUTMEGS—28c.
ORANGES—$4·00 to $4·50.
PIMENTO—8¾c. per lb.
SUGAR—Centrifugals, 96°, 6·055c; Muscovados, 89°, 5·155c Molasses, 89°, 5·052c. all duty paid.

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GOVERNMENT BOTANICAL GARDENS

	Page.
Agriculture in Barbados	55
Agriculture in Nevis	55
Bookshelf	54
Casuarina Woods in Mauritius	51
Corn, Husk Protection for	59
Corn on Cob and Sword Beans as a Stock Feed	55
Department News	53
Gleanings	60
Insect Notes:—	
Suggestions for Mosquito Control in a West Indian Island (*concld.*)	58
Items of Local Interest	55
Maize Oil, Food Value of	56
Market Reports	64
Momordica Cochinchinensis	56
Notes and Comments	56
Plant Diseases:—	
Foot Root or Mal di Gomma on Limes	62
Plant Diseases:—(*Continued.*)	
The Mottling Disease of Sugar-Cane in Porto Rico	62
Rothamsted Experimental Station, The	53
Royal Society of Arts Medals	56
Sea Island Cotton Market	54
Solanum Macranthum	61
Stable Manure as a Phosphatic Fertilizer	57
Sugar Industry:—	
Molascuilt and Megass Meal	53
Sugar By-products in Hawaii	52
Tannias and Eddoes, Cause of Acridity in	57
Turks and Caicos Islands, Industries of	59
West Indian Products	61
Work of the Future, The	49

The Work of the Future.

NEVER was the need for wise planning and prudent forethought in respect to the affairs of tropical colonies so great as it is to-day. With the re-arrangement of large parts of the world's tropical possessions amongst the various nationalities, as the outcome of the policy of reconstruction and re-adjustment after the war, there will be feverish attempts on the commercial side to take advantage of the new possibilities thus laid open, and the novelty of activity in new directions will have its attractive charm.

This has a bearing on West Indian prosperity and its permanence, for these activities will infallibly induce keen competition in connexion with what are regarded as the supporting industries of these colonies. It is necessary now, and not when the pressure of competition is being adversely felt, to look most carefully into the situation, and to see what must be the guiding policy to safeguard efficiently the future of these islands. These considerations should underlie all the efforts of executive officers of governments, of legislators, as well as of those concerned with industries and commerce. Fundamental to all things in these colonies is agriculture, and it is agriculture that is the concern of the competing efforts to which attention is drawn. In the routine of administration concerning all the multifarious activities of any of these communities, it is not always easy to remember that agricultural concerns must always be uppermost. This may be forgotten when dealing in detail concerning such matters as collecting general revenue, the levying of taxation, matters of public health, police and the maintenance of public order, and the hundred and one things which go to make up the daily routine of administration. But underlying all in these colonies is agriculture, and unless the bearing of each and all of these several matters on ultimate agricultural welfare of the community recognized, troubles and difficulties are bound to ensue.

Such considerations lead one to the reflection that the several industries upon which the welfare of these islands rests will be the subject of much thought and energy in the direction of progress on the part of those who desire to develop the new areas brought into the arena of tropical agricultural production by the changes induced by the war. Keen competition will result. Those dependent on the prosperity of these

islands must be awakened to the necessity for the exercise of means of self-preservation: they must survey their position, and see how they can best meet the attacks of competition.

Obviously, the principal element of strength in their position lies in the fact that they are already in possession of the field; it remains for them so strongly to entrench themselves there as to defy attack. There is no undue selfishness in this, for it implies the preservation of existing industries to the world, instead of leading, by apathy and ineptitude on the part of the possessors, to inducements to develop similar industries by new comers in places where those industries do not yet exist. It means the preservation of the occupied territory to the existing industries, and the leading of the explorers of new countries to attempt new industries rather, than to compete with existing ones to the extent of ousting them.

But such a position lays heavy obligations on the exponents of the existing industries. The eyes of the competitors will be continually upon all their doings, and any shortcomings will be seized upon as inviting competition. It will be a state of perpetual economic struggle, or war, if one follows the prevailing tendency in terminology.

All this implies the constant, vigilant survey of the position, and the constant scrutiny of every agricultural effort in order to measure its efficiency, and in order to see whether it presents points of weakness which may be strengthened. There are many ways in which this vigilance must be exercised. In many industries the keeping of careful account, not only of the monetary transactions of agricultural enterprises, but also of the material involved, will afford some means of gauging the position. In the sugar factory this is becoming more and more recognized as a sound basis of management and administration; it has led to many economies and to obvious development. This function is not, however, exercised as fully as the critical circumstances of the West Indian sugar industry really demand, and one feature is largely lacking, that is the exchange of information between those concerned in the work. There is also some defect in the manner in which even such information as is available is scrutinized, so as to derive from it the full benefit that it may confer.

In addition to this, agricultural processes need the application more definitely of the principle of keeping records of facts relating to the quantity and cost of the various crops produced, and particularly is there the need for studying and sifting the information that may thus be got. The mere compilation of statistics is of little use; the point is to force out the lessons which the statistics may teach, and to act upon them.

While the agriculturists must each work energetically for the development and protection of his own industry, modern conditions have made community action essential in many directions, so that intense individualism must have its counterpart in intelligent common action. Much of this implies invoking the functions of government, and thus the intelligent co-operation of government officers and legislators is essential to safety.

As regards community action, it may be well to point to some of the principles which guide it. When the actions of an individual are self-contained, and do not appreciably affect his neighbours, he may be allowed to follow his activities in his own individual way. But there are many cases where such isolation is not possible and the individual must be controlled for the good of the community. Many such cases arise in connexion with pests and diseases—not only those affecting human beings, but also in connexion with those affecting crops and the animals connected with agriculture. Such considerations lead to regulations taken for the control of plant pests and diseases, as well as those affecting animals. These regulations, in order to be effective have to be entrusted to the care of government officers; it is, however, very necessary that there shall be a proper appreciation of them on the part of the general community, or they are nullified or evaded.

Another type of community action is exemplified in the cotton industry of these islands. In order to maintain the character and quality of the cotton lint it is necessary to ensure the purity of type of the seed used for propagating the crop. Now the types of cotton grown are not perfectly pure, or true to type, consequently, by cross-pollination there is a tendency for the undesirable types to increase. These would find their way into general cultivation, and the quality of the cotton produced in a district would steadily deteriorate, unless special steps were taken to provide pure seed every season, and also to prevent the introduction of undesirable types, liable to add to the general deterioration. Such matters necessitate community action, and possibly, even, government interference.

Many other circumstances warranting community action might be mentioned, such as those connected with the production of standard articles, or fruit and the like, whereby the reputation of a community is sustained, and the industry upheld. Again, some industries must be conducted on an adequately large scale to

arrant, either the employment of sufficiently skilled ndividuals, or to ensure the provision of means of carry- g on the industry. In the latter category, some such atters as transport, whether by land or sea, or the ecuring of sufficiently large markets such as to warrant e continuance of the industry, must be taken into ccount.

It may be well to give consideration to the position some of the staple products of the West Indies, in der to see what are the strong and the weak points their position. Some consideration of these matters ill be given in another article.

The point which may be enforced now is that the tention which will, of necessity, be drawn to the possi- lities of development in tropical countries whose dis- osal will be the concern of the Peace Conference, will ad to the development of industries which may serious- compete with those now constituting the staples of e West Indies, and that the strength of the West ndian position lies largely in being in possession of the eld. To retain this position involves the earnest care nd definite study on the part of all concerned in the elfare of the colonies, whether their concern is on the de of government and administration, or whether it agricultural and commercial.

CASUARINA WOODS IN MAURITIUS.

In the editorial in the *Agricultural News*, July 13, 1918, ference was made to the possibility of the establishment in eas beyond the beaches in West Indian islands of regularly own woods, such as Casuarina, with a view to supplying el.

Dr. H. A. Tempany, Director of Agriculture, Mauri- us, in noticing this editorial, writes to say that in Mauritius e practice suggested is thoroughly well established and rms an almost indispensable adjunct of the sugar industry. he following information is chiefly derived from Dr. Tem- ny's letter. It seems that under an old French decree of 07 the whole of the lands along the sea coast of Mauritius, a minimum depth of 81 metres from high-water-mark, rm part of the 'Domaine publique'. The sequestrated lands ve remained the property of the Government ever since. or many years the Government was in the habit of leasing ese lands to adjoining sugar properties, and the habit of anting them in trees gradually became general. Not only d their value as sources of fuel become recognized, but also some extent their utility as shelter belts to inland cultiva- on. *Casuarina equisetifolia* became generally regarded as e most suitable tree for the purpose of planting on this a-coast belt.

In 1895 the Government passed an Ordinance regulating e leases of these lands, and prescribing that with certain w exceptions they should only be leased for tree planting rposes. Special forms of leases were drafted under the dinance, in which the conditions were strictly specified. The nner in which the leases were allotted was by public auction. The leases contained provisions for regulating cutting and replanting.

The total area of these lands, which are known in Mauritius as the 'Pas Géométriques', is approximately about 6,300 acres. Of this area about 4,410 acres are at present under *Casuarina equisetifolia*, locally known as 'Filao'. The remainder is either under coco nuts or mixed species of trees, or is barren unproductive land. It is however contemplated that the Pas Géométriques on the leeward coast of the island should ultimately be transformed into coco nut plantations to the amount of about 1 500 acres, the balance continuing to remain available for Casuarina planting.

In the leases granted, the distances apart for planting and the system of felling are indicated. The most usual system adopted is to plant the Casuarina trees at distances from 10 to 12 feet apart, and to cut them all down at an average age of ten to twelve years. At this age eleven trees on an average give about 96 cubic feet of wood, while the average weight of that amount is 2,200 kilos. If the trees are allowed to grow longer, the yield is greatly improved; trees of fifteen years old give the same amount of wood for an average of six trees with considerably greater weight; while trees of twenty years of age only require four trees to give the same result. The Indian Forest Department, it is stated, have arrived at the conclusion that the most satisfactory rotation for Casuarina is thirty years, comprising a system of intermediate feelings at different ages, and clear cutting at thirty. This system, Dr. Tempany states, will shortly come into force in Mauritius.

The Casuarina wood is used very largely in Mauritius as additional fuel for the sugar factories, although the demand for it has somewhat declined in recent years, as improvements have been installed in the factories by the installation of green megass furnaces. There is still however, locally a large demand for fuel. The fuel value of Casuarina wood is high, and is calculated to be very nearly double that of ordinary mixed forest wood. The price paid for Casuarina wood in Mauritius is high enough to make the Casuarina plantations very paying investments. Apart from fuel value, Casuarina wood can be used for beams and supports, although it is not suitable for making planks, and does not last if imbedded in the ground.

Another interesting point in connexion with these Casuarina woods in Mauritius is the way in which they have been utilized for pasturage. A grass, locally known as 'herbe bourrique' (*Stenotaphrum glabrum*, syn. *complanatum*), will grow right up to the base of the trunks of Casuarinas, and thrive luxuriantly under their shade. The practice in Mauritius is to establish this grass between the rows of the Casuarina trees, and as soon as these have attained sufficient size, that is to say from four to five years old, cattle are regularly pastured between them.

This grass, *S. glabrum*, which is described under several other specific synonyms occurs, according to Grisebach, in most of the smaller West Indian islands, especially in sandy tracts near to the sea, but it has never been considered of special value in these islands for pasturage. It would be well worth while investigating its value in this connexion, as its property of growing right up to the base of trees, and under relatively heavy shade would render it peculiarly useful.

Dr. Tempany also forwards a photograph of one of the tropical Casuarina plantations in Mauritius, with this grass growing through it, which shows that, apart from the economic importance of the system, these Casuarina plantations possess great value from an aesthetic point of view. He says that they make the littoral of Mauritius the most charming that he has ever seen in any tropical country.

SUGAR INDUSTRY.

SUGAR BY-PRODUCTS IN HAWAII.

At the annual meeting of the Hawaiian Sugar Planters' Association, November 1918, the committee presented a report on the by-products of the industry, which is published in the *Louisiana Planter*, December 28. This subject has already been noticed in previous issues of this journal, but it is evident that the development and application of new uses for the by-products of sugar manufacture must become a subject of increasing interest. The manner in which it is proposed to deal with these by-products in Hawaii gives a good lead in this direction.

The average crop of the Hawaiian Islands yields approximately 5,000,000 tons of cane. As by-products of the manufacture of sugar, there are annually in round figures:

	Tons
Megass, 23 per cent of the cane. . . .	1,150,000
Press Cake, 2¼ per cent. of the cane	112,500
Molasses, 3 per cent of the cane. . . .	150,000

MEGASS. At present the megass, with the exception of a small amount for feed mixtures, is entirely used as fuel to generate steam in the manufacture of sugar. Put to such use, it has a value corresponding to the fuel which would have to be used to replace it, should the megass be utilized for other purposes. It requires 6 lb. megass to generate the same amount of steam as 1 lb. of crude oil. One ton of megass is equivalent to one barrel of oil. With oil at $2 a barrel, megass is worth $2 per ton.

At Olaa there is in process of erection a 500 h.p. paper plant designed and to be equipped to manufacture from megass, an asphalt roofing paper, to be used as a paper mulch for the suppression of weeds in the cane fields. This plant will have a capacity of 16·5 tons of finished asphalt paper per twenty-four hours, which will require 30 tons of megass or about 10 per cent. of the total produced per day. It is so designed as to permit the production of roofing and sheathing felts, tissue paper, wrapping paper, card and box boards, should it be found desirable. The general method for the manufacture of paper from megass is first to sift the megass as it comes from the mills in order to remove some of the pith; the megass is then digested in two revolving drums, where it is subjected to the action of steam-heat and milk of lime. Then it goes through the beaters, where the fibre is still further separated. The pulp is next thrown on the drying screens and passed through the mills, where it is further dried, and pressed to the required thickness and width. The paper is then saturated with asphalt to the extent of 40 per cent. of its total weight.

It may be observed in this connexion that the pith removed in the first instance may be utilized as a component of stock food.

PRESS CAKE. This by-product is now used entirely for fertilizing purposes, and there are available about 112,500 tons each year. Should occasion arise whereby it became possible to use this by-product for other purposes, it would be essential to know the value of it as now used. Analysis of dress cake, as it is put on the field, would indicate a value of about $4·50 to $5·50 per ton; the true value can only be determined by the results obtained.

MOLASSES. Possibly to West Indian readers, however, the most interesting of the recommendations will be as to the method of dealing with molasses. It must be remembered that the Hawaiian molasses is entirely the product of vacuum pan factories.

As fuel, a ton of molasses has about the same value as a ton of megass or a barrel of oil. When burned for the potash having a value of $5·00 per unit, a ton of molasses is worth approximately $15·00 per ton.

A very interesting method for the manufacture of a substitute for gasoline has been developed and brought to a practical application by Mr. Foster, Superintendent of the Maui Agricultural Co's mill.

It will doubtless be remembered by our readers that a similar substitute has been successfully manufactured in South Africa during the last year or two under the name of 'Natalite.'

Motor alcohol, modified as a substitute for gasoline in an ordinary gasoline engine, has been produced in considerable quantity by the Maui Agricultural Co., and by them subjected to a wide range of tests, all of which were successful in showing a high degree of efficiency for the new fuel.

It was found that not only was no carbon deposit formed, but that the engine was rapidly cleaned from old carbon deposits. The engines would run with less vibration, with less lubricating oil, and at a uniformly higher speed than the same throttle opening would give on gasoline.

It was also found that the engine would develop more power than with an equal consumption of gasoline.

Much of this is doubtless due to the elimination of the carbon deposits which is caused by the formation of steam from the water contained in the alcohol and the water created by the combustion, and necessarily results in the smoother operation and higher efficiency of the engine.

Formula No. 3, for completely denatured motor alcohol which has been manufactured at Maui, is as follows: To each 100 gallons of grain alcohol add not less than 5 gallons of ether, 2 gallons of benzine, and 1 gallon of commercial pyridine.

The sulphuric ether is cheaply and easily produced, and the cost of the process will be affected by the cost of the ether.

No satisfactory data can be given as to the cost of the alcohol. In the first place, the value placed upon the molasses, is variable, and in the second place, the distillery costs will depend upon its capacity and location. The best plan would probably be to run distilleries in connexion with large factories.

No estimates of the cost of the distillation will be complete without considering the fertilizing value of the molasses, and it should not be forgotten that the refuse liquor from a distillery will also contain the total phosphoric acid and nitrogen values of the molasses. From this it would appear that where arrangements can be made to utilize the fertilizing value of the distillery refuse, that value will considerably help in the profitable working of the process.

It is inevitable that the time will come, sooner or later, when the lack of petroleum fuel will compel the use of alcohol for internal combustion engines, and it is certain that the demands made by the war have brought that time appreciably nearer.

The total importation of gasoline and distillate into the Territory is about 9,000,000 gallons annually, and the amount of alcohol which can be produced from the waste molasses is approximately the same amount, so that it is quite within the realm of possibility for the islands eventually to become independent of the mainland for fuel for internal combustion engines.

The mention above of the amount of gasoline imported into Hawaii for use in internal combustion engines, and how that may be substituted by locally manufactured motor spirit, leads to the reflection that a similar substitution might possibly be found profitable in the sugar making West Indian islands. For instance, it is stated in the Barbados *Blue Book*, 1917-18, that 156,919 gallons of gasoline were imported in that year. It is also stated that 628,586 gallons of vacuum pan molasses were exported in the same period. This is the only grade of molasses which could perhaps be used profitably for the production of motor spirit, the other grades being far too valuable for such use. It might be found in the future, in the face of a falling market, more profitable to retain this low grade molasses for conversion into motor spirit than to export it at a low price.

MOLASCUIT AND MEGASS MEAL.

In his address delivered as President, to the British Guiana Royal Agricultural and Commercial Society on February 4, 1918, Professor J. B. Harrison, C.M.G., said that in 1897 the sole by products of the sugar industry were molasses and rum distilled from it, but a few years later Mr. George Hughes, F.C.S., introduced a process for the preparation from the sugar-cane molasses of a high grade cattle food. This food consists of a mixture of the vacum pan molasses with the finer particles of the interior sponge tissues of the sugar-cane, which are separated from the megass produced during the grinding of the sugar cane. The mixture results in a dry, brown-coloured, coarse powder, possessing a very fragrant and attractive odour. Its characteristic is the high proportion—72 per cent.—of its readily digestible constituents, and especially the high digestibility of the fibre present in it. In some years past the exports of cattle food—Hughes' molascuit, and modifications or imitations of it—have been in excess of 12,000 tons. War conditions unfortunately have recently greatly reduced the exports of this important by-product.

A letter lately received from Mr. George Hughes gives some further information on this important industry. It would seem that in the future there are possibilities of considerable development in the blending of molasses and the pith of the sugar-cane

Mr. Hughes says that the pith of the sugar-cane from which the juice has been expressed is highly digestible by cattle, more so than hay. It should not therefore be burnt for fuel, but be separated from the outer rind of the cane by screening, the latter being used for fuel as hitherto.

This megass meal is a perfect absorbent, and will take up five or six times its weight of molasses. The product, after the absorption of the larger quantity of megass, forms an admirable meal for cattle feeding. With the absorption of the smaller quantity it can be compressed into blocks, and might be utilized in distilleries for making industrial alcohol, which will be so urgently wanted in the future. Such blocks would form an easy, practical, and economical means of transporting molasses,—another great point in favour of the process.

DEPARTMENT NEWS.

Mr. W. Nowell, D. I.C., Mycologist on the staff of the Imperial Department of Agriculture for the West Indies, left Barbados for Grenada on Febuary 20, for the purpose of continuing his investigations on the disease of coco-nut trees.

THE ROTHAMSTED EXPERIMENTAL STATION.

In the introduction to the report on the Rothamsted Experimental Station, Harpenden, for the three years ended 1917, a brief history is given of the station and its object, which is of general interest to agriculturists throughout the world.

The Rothamsted Experimental Station began with systematic field experiments started by the late Sir John Lawes in 1843. It has never been connected with any external organization, but was long maintained entirely at his own cost. In 1889 he instituted a trust for the continuance of the investigation, setting apart for that purpose certain areas of land on which the experimental plots were situated, and a Trust Fund of £100,000.

During the year 1911 a scheme for the encouragement of agricultural research was issued by the Board of Agriculture, funds being provided by the Development Commission. Under this scheme the Rothamsted Experimental Station is recognized as the Institute for dealing with Soil and Plant Nutrition Problems. An annual grant of £2,500 was made, which has since been increased to £2,850.

The field experiments which began in 1843 have, on some of the plots, been continued without break or alteration up to the present day. It is impossible to exaggerate the importance of continuing the experimental plots at Rothamsted without any change, as nowhere else in the world have such extensive data been collected for studying the effects of season and manuring upon yield and quality of crop, and for watching the progressive changes which are going on in the soil. Year by year the plots are found to throw light upon new problems in agricultural science: in all directions they continue to provide material for investigations upon points which were not contemplated in the original design of the experiment, so that it is impossible to foresee when or how soon they will become useful, and provide indispensable material for the solution of problems undreamt of at the present time.

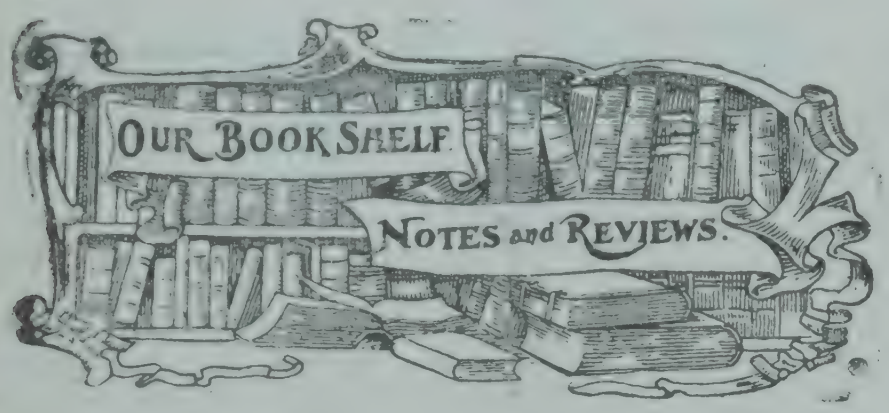
There are 210 plots, and every year 243 samples have to be taken with proper precautions, and put into store for future reference. Complete soil samples are periodically taken for analysis, to enable a comparison to be instituted with samples taken earlier, and thus to study the soil changes that have gone on during the period.

It should be remembered that the object of the Rothamsted experiments is to study the soil and the crop, and only indirectly to find the most paying method of manuring.

As the shifting agricultural conditions bring new problems into prominence, these are brought as far as possible into the scope of the investigation. The danger that experimental work may become artificial and remote from practice has been met by setting up an ordinary farm of 230 acres in addition to the experimental area.

For many years past the purpose underlying much of the Rothamsted work has been to restore the tradition of good farming and of good country life. By common consent Great Britain led the way in farming practice in the fifties, sixties, and seventies of the last century. This fine position was lost in the eighties and nineties; the falling prices for agricultural produce for that period were met by lowering farming methods. Fortunately the error was realized early in this century, and farmers have endeavoured to retrieve the situation.

At the present time the enquiries at the Rothamsted Experimental Station fall into four groups: the economical use of measures, the ploughing up of grass land, the control of soil organisms, and the nutrition of plants.



A TEXT BOOK OF CHEMISTRY, INORGANIC AND ORGANIC, WITH TOXICOLOGY, FOR STUDENTS OF MEDICINE, PHARMACY, DENTISTRY, AND BIOLOGY. By R. A. Witthaus, A.M., M.D., late Professor of Chemistry, Physics, and Toxicology in Cornell University; Seventh Revised Edition by R. J. E. Scott, M.A., B.C.L., M.D., Fellow of the New York Academy of Medicine, Editor of Witthaus' Essentials of Chemistry and Toxicology, etc, etc.; pp. iv + 477. *William Wood and Co., New York.*

Chemistry at the present day finds application in a great variety of ways and in a great number of arts and sciences; in consequence of which text-books on the subject are required to be prepared with definite objects in view; their writers to be successful must keep in mind the requirements of the students and workers for whom their books are intended. This has been eminently the case in connexion with the text book under review; the book is intended for students of Medicine and allied Sciences and Biology, and it is evident that the writer of the present edition, Dr. J. E. Scott, has had their requirements carefully in mind during the work of preparation. The suitability of the work as affording a useful guide and reference book for biology students, amongst whom are to be included students of agriculture, warrants reference to it in these pages

The book in its first section deals with the general principles of chemistry, and in a clear, concise manner gives an insight into the fundamental concepts of physical and general chemistry, affording as much information as is likely to be assimilated by the ordinary medical or agricultural student, but giving that information in such a manner as will prove of service to those students whose work leads them to seek fuller information in more specialized text-books on these subjects, the need for reference to which is emphasized in the preface.

The other two sections of the book deal with Inorganic and Organic Chemistry respectively. Here the information is given in an orderly manner, and the points which should arrest the attention of the student are prominently brought forward. The portion devoted to Inorganic Chemistry gives a succinct account of the essential facts pertaining to this branch of the science, and it appears to be sufficiently full for the purposes for which it is intended.

The section dealing with Organic Chemistry is well arranged, and the information clearly presented; care has been taken, as stated in the preface, to avoid making this section a mere catalogue of names and formulae, and a useful and interesting book results.

The book has been tested as a work of reference, with satisfactory results: the definitions and facts sought are found to be stated with precision and marked clearness.

Although it is impossible for modern chemistry to be learned from text-books alone—for laboratory work and practical demonstrations are absolutely essential for obtaining an intelligent grasp of the subject—the book under review constitutes an excellent manual for the student of medical and biological sciences, as an aid to his practical studies, and as a book of reference afterwards.

The index seems to be very carefully prepared. One point is specially worthy of commendation, namely the grouping of various matters under headings, as for example the bringing together in this manner the various 'Tests'.

In conclusion praise must be awarded to the excellent format of the book, and the clearness of the manner in which symbolic and constitutional or structural chemical formulae are printed, in connexion with which a point to be noticed is that most of the former are printed in a single line clearly standing out from the rest of the text.

SEA ISLAND COTTON MARKET.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended January 25, 1919, is as follows:—

ISLANDS. The market has been dull throughout the week, with limited demand, resulting in sale of 100 bales Fine to Fully Fine, slightly off in preparation, at 53c. f.o.b. and freight.

As the stock is accumulating, the Factories are showing more disposition to sell, and it is probable that they may consent to make concessions from their asking prices, and accept a positive offer for quantity, based on our quotations.

We quote viz:—

Fine to Fully Fine, 54c., f.o.b. and freight.
Fine to Fully Fine, slightly off in preparation, 53c., f.o.b. and freight.

PLANTERS' CROP LOTS OF EXTRA FINE. There is no demand at present, but the crops are firmly held at very full prices, the supply being very limited.

GEORGIAS AND FLORIDAS. The Savannah market remains dull, the stock in Factors' hands consisting very largely of old crop cotton, which is not being offered at current prices.

There is, however, a more general demand from the trade, which is being filled in the interior market, on a basis of our quotations.

The United States Census Bureau, reporting only 41,088 bales ginned to the 16th inst., fully confirms total crop estimates of less than 50,000 bales. Consequently it is the general opinion that the limited supply will be required, and that prices now current are reasonable and do not admit of much, if any, further decline.

We quote, viz:—

Extra Choice to Fancy, 54½c., f.o.b. and freight.
Average Extra Choice, 54c., f.o.b. and freight.

The exports from Savannah for the week have been: to Northern Mills, 935 bales, and from Jacksonville to Northern Mills, 528 bales.

The United States Census Bureau reports the amount of Sea Island cotton ginned to January 16, as follows:

South Carolina	7,306 bales	} making a total of 41,088 bales			
Georgia	17,701 ,,				
Florida	16,081 ,,				
against last year	88,747 ,,	total crop	88,174	bales	
,, 1917	115,463 ,,	,, ,,	113,109	,,	
,, 1916	90,736 ,,	,, ,,	85,278	,,	
,, 1915	79,484 ,,	,, ,,	78,857	,,	

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST

ST. VINCENT. During the month of January cultural operations mostly comprised work in the Botanic Gardens. Plant distribution included 1,600 cane cuttings Some difficulty was experienced, Mr. Sands says, in getting arrow-root reaped, as the soil was dry and hard. Ground provision crops were plentiful. The cotton crop was holding out well and good pickings of white cotton continued to be obtained. It is estimated that 450 bales of 360lb. each were ginned by the end of the month. The manufacture of syrup in preference to sugar will be undertaken on several estates: operations in this connexion have commenced. The annual campaign against food-plants of the cotton stainer has begun. The rainfall recorded at the Botanic Station for the month was 5·36 inches. at the Experiment Station the precipitation was 5·73 inches;

ST. LUCIA. Plant distribution during the month of January was as follows: lime plants, 500; budded oranges, 10; grafted mangoes, 9; coffee (Robusta), 90; nutmegs, 42; ornamental, 29; tobacco seeds, 6 oz. and 2 packets; onions, 2½ lb; vegetable seeds, 31. The lime and cocoa crops were slackening, while the reaping of sugar-cane was general. Considerable quantities of provisions were received at the Government Granary and Provisions Depôt during the month. The rainfall recorded at the Botanic Gardens, Castries, for the month was 17·64 inches; at the Botanic Station, Choiseul, 4·08 inches was the record.

AGRICULTURE IN BARBADOS.

While the crop to be reaped is a satisfactory one, we would note that it will, to some extent, fall below the expectations of a few months ago. We have had trying weather for all crops since the end of November, and the canes will not only be forced ripe, but they will naturally be less juicy than they would have been under more favourable conditions. We already know that the B. 6450, even where the canes look healthy and vigorous, have, developed dry centres, and the ratoons are practically where they were in the middle of December.

The prospective price of syrup is said to be such as to make it more remunerative for those who can do so to reap their canes in preference to selling them to the factories, even at the advanced price of crystals.

We urge producers to prepare syrup in the best possible manner, and to send away from their boiling houses a thoroughly clean article.

We regret to say that, owing to weather conditions, the start in general of the young crops has been more irregular than last year. About one-third of the fields are growing well, but the remainder have required an abnormal amount of supplying, and will have to be supplied again and again before anything like regularity will be obtained.

The Guinea corn crop will be a moderate one. This was to be expected, as this crop is principally grown in the seaboard parishes. Potatoes are more plentiful than at this time last year, but they have risen to $1·00 per 100 lb. But little now remains to be reaped of the yam crop, and during the past fortnight the price of this vegetable has risen from $1·00 to $1·20 per 100 lb. (The Barbados *Agricultural Reporter*, February 8, 1919.)

AGRICULTURE IN NEVIS.

From the report of the Agricultural Instructor, Nevis, for the quarter ended December 31, 1918, the following matters of interest concerning plots in the Experiment Station, and the condition of staple crops in the island, are abstracted.

The yield of cotton from the demonstration plot was somewhat disappointing, owing to the fact that before the completion of the first picking, heavy rains fell, causing a considerable amount of boll dropping In addition to this, cotton stainers were very abundant during the season, and caused internal boll disease and the shedding of a large number of young bolls. The plants took on new growth, but very few bolls are holding on, consequently there is little prospect of any second picking. The return, so far, is about 150 lb. of lint per acre. The 1-acre plot of sweet potatoes was reaped during the quarter, and a return of 7,340 lb. of potatoes was obtained. The crop was all sold in the local market.

The cane crop throughout the island has very much improved, and fair returns will be obtained from many of the fields. Preparation for next season's crop is in progress, and there will be a great increase in the acreage put under canes, which is made up to a great extent of lands which were in cotton. Schemes for the manufacture of fancy molasses, and for a better system for the transportation of canes to the St. Kitts sugar factory are being discussed.

The cotton crop this season has fallen short of the planters' expectations. The average return per acre will be very low in some places, especially from late planted fields, chiefly on account of the heavy rains and the persistent attacks of insect pests—the cotton worm and the cotton stainer. The total amount of cotton purchased for the Imperial Government to the end of the quarter was 325 bales, or 160,099 lb. net.

The provision crops, on the whole, are satisfactory, and reaping operations are in progress. Sweet potatoes are selling cheap; there is no market for large quantities.

The rainfall for the quarter was 19·56 inches; for the year 53·98 inches.

CORN ON COB AND SWORD BEANS AS A STOCK FEED.

Attention has been drawn to the use of corn on the cob in several previous numbers of this journal. To make it a balanced ration for stock, however, it is necessary to add some product rich in nitrogenous matter or protein.

The following analysis of such a ration is taken from the *Bulletin of the Department of Agriculture, Trinidad and Tobago*, Vol. XVII, Part 3:—

Mr. H. Meaden, Manager of the Government Farm, Tobago, prepared a mixture composed by weight of one part of corn, three parts of corn cob and one part of white sword beans (*Canavalia ensiformis*) It has been analysed by Mr. H. S. Shrewsbury, F.I.C., acting Government Analyst, with the following results:—Composition: (per cent.) ash, 1·4; fat, 2·4; protein, 10·7; moisture, 11·7; woody fibre, 9·2; and carbohydrates, 54·6. The total food units are 87·3 of which 61·0 are digestible. The latter may be compared with the digestible units in average pasture grass, 46; in oats, 73; and in corn (maize) grain, 97. Mr. Shrewsbury adds: 'the sample represents a balanced stock feed of moderate food value'.

It may be remarked that white sword beans have been used for stock feeding for the last two years in Trinidad on some of the estates of the Usine St. Madeleine.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†Provided by the Imperial Department of Scientific and Industrial Research.

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial contains advice to agriculturists in the West Indies with regard to their necessary work in the future.

Under Insect Notes, on page 58, will be found the conclusion of the article on mosquito control, the first part of which appeared in the previous issue of this journal.

The first article under Plant Diseases, on page 62, deals with foot rot on lime trees, the second gives an account of the latest researches with regard to the mottling disease of sugar-cane in Porto Rico.

Royal Society of Arts Medals.

At the meeting of the Royal Society of Arts, November 20, 1918, the Chairman presented the Society's Medals, which were awarded for papers read during last session, among which the following have been noticed in the *Agricultural News*:—

W. Lawrence Balls, Sc.D., 'Examples of Applied Science in the Cotton Industry'.

George Martineau C.B., 'Sugar from several Points of view'.

Professor J. Bretland Farmer, D.Sc., F.R.S., 'The Rubber-Planting Industry'.

Sir Walter Egerton, K.C.M.G., LL.D., 'British Guiana and the Problem of its Development.'

Momordica Cochinchinensis.

A box of seeds of this plant has recently been received from the Royal Botanic Gardens, Kew, by the Imperial Commissioner of Agriculture for the West Indies, to be distributed in the West Indies for trial.

In forwarding the seed, Mr. Arthur W. Hill Assistant Director of the Kew Royal Botanic Gardens, writes that they contain an oil similar to tung oil which is extracted from Aleurites. Preliminary investigations of this oil show that it is remarkable for its drying properties, and is likely to be valuable in connexion with aeroplane work.

As the development of aeroplanes is certain to take place in the future, the oil from the Momordica seeds may be of some commercial importance.

According to the description of *Momordica cochinchinensis* given in the *Cyclopedia of American Horticulture* it must be a very showy plant. Like the other species of the genus it is a climber, with three-lobed leaves, pale yellow purple-eyed flowers 4 inches across, and an oblong, bright red fruit, from 4 to 7 inches long, enclosing curiously sculptured flat seeds, about an inch in diameter. It is to be hoped that this species may become acclimatized in these islands.

Another species of Momordica is well known in the West Indies. This is *Momordica charantia*, locally known by various names; in Antigua it is called 'Maidens' blush'; in Barbados, 'Miraculous'. In American seed catalogues it is listed as 'Balsam Pear.' It is an ornamental annual vine belonging to the natural order Cucurbitaceae. Its yellow flowers, about an inch across, are succeeded by bright orange coloured fruit, 2 to 3 inches long, which when ripe split and disclose the bright scarlet arils surrounding the brown seeds.

The Food Value of Maize Oil

In the *Transactions of the Kansas Academy of Science*, Vol. XXVIII, 1917, there is an interesting article by L. E Sayre on this subject. It seems that the writer had already shown in a previous paper the value of this product in making medicinal preparations. The present paper, from which the following is abstracted, records the author's conclusions as to the value of corn oil in the form of salad oil and as food.

Very large quantities of maize are used in the United States for the manufacture of starch, and the importance of utilizing the oil from the embryo or germ of the grain, which contains from 4 to 5 per cent. of oil, is realized by the manufacturers of starch, as some of these use as much as 20,000 to 40,000 bushels of corn per day. In order to recover the oil, the embryo must be separated and then hydraulic pressure is employed. After the crude oil is recovered, a process of refinement follows, producing an article which from the food point of view is remarkably fine. The importance of this industry is shown by the fact that in 1916 it is stated that 82,000 000 lb. of crude corn oil were produced in the United States, at least one-half of which was refined. The crude oil is largely used by soapmakers.

Of the refined oil a small amount is used for making camphorated oil, which is a solution of camphor in a fixed oil. It is also used in some of the largest biscuit factories in the United States, and also by bakers of bread throughout the country. Bakers prefer to use corn oil rather than cotton-seed oil, because of its better keeping qualities, and because of its being more economical. Corn oil is also used for the manufacture of artificial rubber.

The food value of corn oil as compared to butter is stated to be that the former has an energy value of about 4,000 calories per pound, while the latter, containing a considerable percentage of water and salt, has an energy of about 3, 400 calories per pound.

The United States Department of Agriculture recognizes maize oil as an edible oil obtained from the germ of Indian corn, and it is reported on favourably as an oil especially suitable for salad dressing.

Stable Manure as a Phosphatic Fertilizer.

The *Experiment Station Record*, October 1918, has an interesting note on extensive experiments with stable manure as a source of phosphorus for sugar-cane on soils of different phosphorus content. These experiments were undertaken in Java by J. M. Geerts, and described by him in the publications of the Sugar Experiment Station. Java. The results of these tests are held to indicate that stable manure is an excellent phosphorus carrier for sugar-cane, and also confirm results obtained with superphosphate on similar soils.

On phosphorus-poor soils the addition of stable manure resulted in average increases of 8·06 per cent. in yield of cane, and 7·63 per cent. in yield of sugar, while in soils well supplied with phosphorus increases of only 1·76 per cent. and 1·37 per cent. were obtained. Applications of the manure to soils with a low phosphorus content resulted in average increases amounting to 6·57 per cent. of cane, and 5·71 per cent. of sugar. Soils with an intermediate phosphorus content showed average increases in production after treatment with the manure of 6·66 per cent. of cane and 6·79 per cent. of sugar.

Stable manure applied to light soil was not so effective in results as phosphates, but was effective on heavy soils. In a comparison of stable manure and superphosphate on phosphorus-poor soil, decided increases in production were noted in favour of the manure, amounting to 6·13 per cent. for cane, and 5·73 per cent. for sugar. Similar tests on soils of low phosphorus content showed increases of only 1·37 per cent. of cane and 1·76 per cent. for sugar; while on soils of unknown phosphorus content the increases amounted to 1·17 per cent. for cane and 1·5 per cent. for sugar, all in favour of the manure.

Cause of the Acridity in Tannias and Eddoes.

Calcium oxalate enters into the composition of a great variety of plants. It is an insoluble salt, and therefore when formed in the plant tissues it separates as a solid from the plant juices. The solid crystals may easily be detected under the microscope in various forms in the tissues of plants. Theys are often found in bundles of fine, needle-like crystals, packed in cells, and surrounded by a mucilaginous liquid. Crystals of this character are called 'raphides,' and the cells containing them, when brought into contact with water, eject the individual needles which float out slowly into the surrounding medium. Plants which produce calcium oxalate in this form, when eaten raw, cause a painful burning sensation in the mouth, the obvious explanation of which is that when the cells full of needles meet the saliva of the mouth the needles are ejected and penetrate the mucous membrane, thus causing the painful sensation mentioned.

Among the plants which form crystals of calcium oxalate in this interesting form are the various species of Colocasia and Xanthosoma which are known as tannias, eddoes, and dasheens. One of these species, sometimes called white eddoe, is also known as 'scratchy eddoe' in Barbados, on account of its special acridity unless properly cooked. Most of these species possess raphide-filled cells both in leaves and tubers, and this has been assumed to be the cause of their acridity. It has been suspected, however, that this was not entirely the case, because the family of the Aroideae, to which they belong, is known to produce in several instances alkaloids, glucosides, and bitter substances, any of which, if present in the plant, might be wholly or partially responsible for the acrid flavour. Mr. O. F. Black, of the Bureau of Plant Industry, United States Deparment of Agriculture, undertook careful experiments on both the tubers and leaves of the dasheen, to settle the point as to whether the raphide content was the sole factor in causing the acridity of the plant. He has recorded the results of these experiments in the *American Journal of Botany* November 1918. He came to the following conclusions:—

(1) All experimental evidence goes to show that calcium oxalate crystals are the sole cause of the acrid taste of dasheen by the mechanical irritation of the mucous membrane of the mouth.

(2) As the acrid flavour can readily be removed by proper methods of cooking, there is no reason why the presence of raphides should interfere with the use of these tubers as vegetables.

INSECT NOTES.

SUGGESTIONS FOR MOSQUITO CONTROL IN A WEST INDIAN ISLAND.

(*Concluded.*)

The elimination of mosquitoes from the vicinity of the dwelling depends on the proper draining or filling in of all breeding places, or stocking with 'millions' all tanks and cisterns, and the removal of all bush and trees which furnish shelter for the adult mosquitoes.

All waste water from the dwelling house should be carried away in properly constructed drains, and no water should be thrown out on to the ground in such a way as to leave any pools or puddles, or even muddy spots.

At the estate referred to there is a large concrete cistern which contains a permanent supply of water. This is stocked with 'millions,' and if it is kept fairly clean of algae and other water plants, it should not be a source of mosquitoes.

A pond below the house is also well stocked with fish, but the cattle come to drink at this pond, and the margin is cut up by the feet of the animal. There is some danger in this, since the smallest amount of water is liable to breed mosquitoes in these depressions. I recommend that this pond be fenced, and the animals all watered at the trough across the road. The margins of the pond should be carefully graded, and no foot prints or other depressions allowed to exist there. No bush or overhanging grass or weeds, should be allowed to grow on the margin of this pond.

The drain, which takes the overflow from the pond, crosses the road and runs down into the savannah, should be properly constructed, and the bottom cemented. The culvert under the road should be made of large drain tiles with a smooth inner surface, and set at a good angle, so that no water can stand in it. Beyond the road, the drain which is badly washed should be filled to a proper gradient, and provided with a concreted surface for some distance.

The trough at which the cattle are watered should be provided with a proper overflow pipe. A smooth cobbled pavement around the trough would prevent any foot-prints of animals leaving any depressions near, where water can stand in them, and the well from which the water is drawn should be provided with a properly constructed curb, and securely covered, either by means of a light wooden cover, or with wire-mesh, to prevent the entrance of mosquitoes.

Any escaping water either from the sugar works or from the still should pass at once into a properly constructed concrete drain, and be carried off. The final disposition of such water and of the overflow water from the ponds and from the watering trough must be a matter for special consideration. If it can be allowed to escape on to the surface of the savannah at some distance from the buildings, in such a manner that it will not provide breeding places for mosquitoes, that might be allowed. It is likely, however, that a properly constructed drain may have to be provided to connect with the drainage system in the sandy soil nearer the beach. The concreting of such a drain would be an expensive matter, and it might suffice to provide a well-made trench with clean sides and with smooth bottom, which could be oiled at intervals by hand, or by means of an automatic arrangement.

For this purpose ordinary kerosene is useful, but it is costly, and it evaporates quickly. Crude oil evaporates more slowly, and it is likely that Trinidad fuel oil would serve for this purpose. If such oil were supplied from time to time, the applications might be made at intervals of from ten to twelve days by means of a knapsack sprayer, using a nozzle of the Bordeaux type, discharging a fine solid stream with some force into the water. The oil would be broken up on striking the water, and form a film on the surface.

The automatic arrangement consists of some device which contains the oil and supplies it to the water in one of two ways. One way of doing this is by means of an automatic dropper. A kerosene tin or similar receptable is fixed over the drain with a cork or spiggot or other device for dropping the oil drop by drop on the water below. In a drain carrying a small amount of water with a slow moving current, ten to twenty drops per minute would be sufficient. The distance apart at which such droppers might be placed would have to be determined by experiment. Another way consists in fixing a box or bag of sawdust saturated with oil in such a manner that the water would pass through it carrying out a small quantiy of oil. By these means, and by the utmost care to prevent any standing water even in the smallest quantities the vicinity of the buildings on the estate in question ought to be freed from all breeding places of mosquitoes. The depression in the pasture near the coco-nut trees should be kept free from water after the drains are completed, and another source of infestation thus removed.

The malaria mosquito is a weak flyer. It flies only short distances except when it is able to gain shelter in the foliage of trees or bush or in long grass. In favourable situations these insects fly from plant to plant, and, especially when travelling with the wind, are able thus to cover some distance. They are said not to travel more than a mile from their breeding place and not more than 200 to 300 yards at a single flight from one shelter to another.

The removal of the bush on the hill side to the east, and the substitution of a close cropped pasture would probably deprive the mosquitoes of their means of approach from the swamp on that side. Any other swamp within, say, $\frac{3}{4}$-mile would need to be taken into consideration for similar treatment. It is said that a dense belt of tree growth acts as a barrier to the dispersal of mosquitoes. It might be worth while to consider a belt of trees along the margin of swamps some distance from the buildings, with carefully kept pasture on the near side of this.

A word may be added with regard to the cattle pens and the houses of the labourers in relation to their proximity to the dwelling houses. Mosquitoes attack practically all warm blooded animals. If mosquitoes are present, and can get to cattle pens and stables, they wil' take shelter there, and find food in abundance in the blood of the animals. From such situations they may travel to the manager's house.

At least 400 to 500 yards should separate the labourers' huts from the dwelling house, as their children are almost universally carriers of malaria in a malarious district, even though they show no signs of suffering from the malady. The labourers should be compelled to maintain the most scrupulous sanitation about their cabins, and no water should be thrown about in such a way as to allow mosquito breeding. Proper drainage should be arranged for.

H.A.B.

INDUSTRIES OF THE TURKS AND CAICOS ISLANDS.

As was noticed in a previous number of the *Agricultural News*, the salt industry of the Turks and Caicos Islands reached in 1917 such a flourishing position as had been unknown for many years. It is hoped in the near future that the salt trade of Turks Islands may be extended to the markets of the Brazilian Republic. The magnitude of trade requirements in this direction, however, places it beyond the capacity of the present salt producers to handle. Arrangements have been concluded with a New York capitalist to take the matter up. This gentleman has leased from the Government, for a term of twenty-one years, the extensive but abandoned salt ponds at West Caicos, and intends to commence work on them at an early date. The output of these West Caicos salinas is estimated at not less than 1,000,000 bushels of salt per annum.

Colonial Reports—Annual, No. 969, refers to other subsidiary industries of the Turks Islands. The sponge industry, in consequence of the war, showed a distinct decline. This industry has also suffered in the year under report through the sudden death of Mr. George Silly, the enterprising lessee of the artificial sponge beds at Chalk Sound in the Caicos Islands. It is believed, however, that this valuable industry will be continued on right lines. Another shallow-water creek, Dell Sound, belonging to the Government, has been leased for the purpose of artificial sponge growing. Operations on this bed were to be commenced during the summer of 1918.

The sisal industry continues to show satisfactory progress. Exports to the value of £5,950 were recorded for the year, more than double those of the previous years. No less than 5,000 acres of land in the Caicos Islands have been leased for the purpose of fibre growing on the most approved lines.

The cultivation of cotton is steadily increasing among peasant landholders in the Caicos Islands. Although only a small quantity at present, the cotton exported to Liverpool was sold for 1*s.* 8*d.* per lb., which is said to have been satisfactory to the growers.

The Turks Islands have a small industry with the neighbouring Republic of Haiti, which is probably unique. Over 3,000,000 conchs—not conch shells—were exported during the year under review as a food commodity to that Republic.

Owing to the difficulty of obtaining tin and other material, the lobster canning industry, which had given promise of development, had to be suspended for the duration of the war.

Another small export industry was likewise brought to a standstill owing to the transport difficulties during the war. This industry is the export of conch and other sea shells, which are shipped to New York for export to Italy, where they are used for cameo work and the manufacture of buttons. Both of these lesser industries will probably be revived in the near future.

HUSK PROTECTION FOR CORN.

Most growers of Indian corn or maize have no idea that by improving by selection the husk covering the corn-shucks as they are called in the United States—they may reduce the damage done to the grain by weevils. Corn growers generally consider only the shape and size of ears and kernels when selecting seed. *Bulletin No. 708* of the United States Department of Agriculture gives the results of some investigations by W. A. Taylor, Chief of the Bureau of Plant Industry, the object of which is to establish definitely some of the more important facts with regard to the husks as a means of preventing damage to the ear.

Weevils attack corn of all degrees of hardness, and the only difference is that they consume the harder corn slower than the softer corn. Some observers have concluded that since weevils are able to eat the hardest corn, they would also cut their way through the most resistant husks in order to feed upon the grain, if sufficiently urged by hunger. Others have observed that earworms may cut holes through a large percentage of the protecting husks, and that weevils will enter through these holes; from this they have concluded that husk-covering cannot be developed into a practicable means of protection. Very little experimental work has been done in the past to determine the relationship that really exists between husks and the corn inclosed in them.

In the investigations fourteen native varieties of corn were included. The ears were harvested without removing the husks. They were then separated into three classes: (1) 'poor shucks,' if the shucks failed to extend beyond the tip of the ear, or if they did not close tightly; (2) 'good shucks without worm holes,' if the husks extended beyond the tip of the ear, and closed more or less tightly; (3) 'good shucks with worm holes'

The results of the investigations in the field showed 43 per cent. more weevil infestation in corn with poor shucks than in that having good shucks without worm holes.

Storage investigation showed 93 per cent. more weevil infestation in corn with poor shucks than in that without worm holes

Laboratory investigation showed that weevils would starve rather than force their way through good shuck covering.

These investigations showed 3 per cent. more rotten, 16 per cent. more discoloured, and 18 per cent. more worm-mouldy ears in poor shucks than in good shucks.

The so-called good shucks of these investigations were not ideal, but only better than the so-called poor shucks. Later investigation made it clear that the longer the husks extend beyond the tips of the ear the more effective is the protection against causes of insect damage. This suggests the possibility of breeding a race of Indian corn with husks long enough to be entirely effective against such damage.

The author concludes his paper by remarking that the investigations appear to justify the following recommendations to corn growers :—

(1) Breed corn with a very long husk extension which fits tightly about the silks.

(2) To protect ear corn in the fields from weevils, ear worms, moulds, and discolouration, grow the best husk-protected corn.

(3) To make practicable the more general holding of corn in weevil-infested areas, store husk-protected ears in their husks, and get rid of the unprotected ears as soon as possible.

The practical bearing of this question on the maize crop is evident, when it is considered that of all the ears of corn produced in the United States each year comparatively few entirely escape damage. Most of them lose only a few kernels from insect attack, or are more or less reduced in value by moulds or discolouration. This damage is usually passed without notice, but when it is considered that a loss of only one kernel per ear amounts to an annual loss for the United States of at least 5,000,000 bushels, it becomes apparent that these losses are worthy of attention.

GLEANINGS.

A useful hint in connexion with the making of coco-nut butter is supplied by Lady Watts, the wife of the Imperial Commissioner of Agriculture, to the effect that the butter is made more quickly by using a small metal ice cream freezer than by the use of a churn, and that only a small amount of ice is required for its production. (The *Journal of the Jamaica Agricultural Society* September. 1918)

Cacao and coffee are the chief exports of the Portuguese West African islands San Thomé and Principe. The shipments of cacao from the two islands in 1914 amounted to 33,319 metric tons, valued at £1 193,933. In the same year the exports of coffee were 472 metric tons of the value of £23,584. (*The Times Trade Supplement*, December 1918.)

The *Colonial Journal*, January 1919 states that it was reckoned that there was in the autumn of 1918 some 200,000,000 bushels of wheat in Australia. This at only 4*s.* per bushel represents £40,000,000 and when it can be shipped it will be worth much more. It was calculated that the wheat available for export would make up 625 shiploads, so that the export will be a long business.

Experiments are being made with sunflowers as a fodder in Southern Alberta and the success which has accompanied the experiment shows that there are great possibilities in this direction with giant sunflowers. The plants averaged from 10 to 12 feet in height, and were cut and fed in a fresh condition to cattle, which seemed to relish them fairly well. It is estimated that fully 15 tons of fodder per acre were obtained. (The *Colonizer*, January 1919.)

Sanitation in British Guiana is evidently being well attended to. In *Colonial Reports*—Annual, No. 976, it is noted that anti malaria and anti-mosquito measures are being generally and gradually enforced with visible signs of success. In 1906-7 there were treated in the sugar estates' hospitals 33,748 cases of malarial fever; by the end of 1917 the numbers had fallen to 11,344. Ankylostomiasis also has considerably decreased on the sugar estates; this is attributed to improved sanitary measures.

The fruits of the Washington navel orange are seedless, as is well known. The reason for this condition is that the flowers of that variety are perfect except that the anthers do not develop pollen, and whenever a Washington navel orange is found, as sometimes occurs, containing one or more seeds, the condition may be explained on the ground of the accidental transfer of pollen from neighbouring pollen-bearing citrus flowers, probably through the agency of the common honey bee. (The *Journal of Heredity*, October 1918.)

Coco-nut cultivation ranks next in importance to that of cloves in Zanzibar. It is estimated that there are about 48,000 acres under coco nuts in the two islands of Zanzibar and Pemba. The quality of the copra produced compares, however, unfavourably with that of Cochin or Ceylon. Much is produced by the small grower or trader, neither of whom possesses proper drying facilities. The faults are remediable, and copra produced from the Government plantation has been most favourably reported on by London brokers. The export of copra from the Protectorate in 1917 was 6,583 tons. (*Colonial Reports*—Annual, No. 973.)

The *Louisiana Planter*, December 21, 1918, states that experiments with centrifugal filters on cane juice and on molasses, though highly promising, need further investigation. The centrifugal filter can hardly be called commercial at the present time for the sugar industry. Doubtless, however, the problems presented in the manufacture of sugar to centrifugal filters will be solved before long. The filtration itself is satisfactory as regards quality, but the cost of operation, the cost of a sufficiently large installation of filters, and the difficulty of handling high speed centrifugals with perfect safety, all stand in the way of commercial adoption of them.

The *Colonizer*, January 1919, states that in South Africa tiles are being made of a composition of concrete and asbestos waste which after, having been placed in large tubs, and beaten by long flanged rollers, is then laid in moulds and turned out in tiles a foot square. The tiles are covered with canvas mats and subjected to pressure. They are then left to dry partially for twenty-four hours, and plunged into water for some hours longer. They are dried again for almost a fortnight, when they are ready for sale. It is claimed that these tiles are an excellent substitute for corrugated iron as a roofing, being lighter and cheaper.

No industry yet attempted in St. Helena has succeeded so well as the production of fibre and tow from the New Zealand flax plant (*Phormium tenax*). With good rainfall, and on friable soil it thrives in the colony with little or no attention, and no insect pest or disease has yet appeared. By the clearing of useless undergrowth, much more land can yet be made available for its cultivation, and it is hoped that planting, both by the Government and by is small proprietors, will be much extended in the near future. The continual rise in price for this fibre on the London market, and the good fortune by which the colony was enabled to get practically the whole of its produce to the United Kingdom without undue delay combined to make the year 1917 a very prosperous one for the industry. (*Colonial Reports*—Annual, No. 974.)

It is remarked in *Nature*, January 16, 1919, that although the area under sugar-cane in Java is only about one-seventh of that devoted to the crop in India the annual production of cane sugar in the Dutch island is not very much less than the annual production in India. In fact, Java is able, after entirely meeting its own requirements, to export large quantities of sugar, for which India is one of the chief markets. The reason of this is that in Java the cultivation of sugar-cane is conducted on the most scientific lines, and the manufacture of the sugar is carried on in modern factories where the processes are chemically controlled at every stage. In India, on the other hand, both the cultivation of the cane and the preparation of the sugar are still conducted in somewhat primitive fashion.

SOLANUM MACRANTHUM.

Mr. R. O. Williams, Superintendent, Royal Botanic Gardens, Trinidad, in an article in the *Bulletin of the Department of Agriculture, Trinidad and Tobago*, Vo. XVII, Part 3, says that one of the most conspicuous objects in the serial grounds of the St. Clair Experiment Station for many months past has been a tree of *Solanum macranthum*, seeds of which were received from the Horticultural Section of the Egyptian Ministry of Agriculture in 1916.

The seedlings were raised in boxes in the nursery, and transplanted when a few weeks old into a bed. Growth was then so rapid that in a short time all except one had to be removed to allow room for growth, and at the age of two years and one month this one is now 30 feet high, with a spread of branches of equal measurement.

The plant commenced to flower when but a few months old, and has never been without flowers since, although at certain times they are more abundant than at others. The flowers are about 3 inches in diameter, and make a magnificent show, as flowers of several tints are borne by the plants at the same time. This is due to the fact that the corolla on first opening is of a rich, bluish violet colour, changing when a day old to a paler blue, and later fading to a bluish white. A curious fact is that the flowers become larger with age, the deep-coloured one-day old flowers being much smaller than those two or three days old. The bright yellow anthers, united, as in all species of Solanum, in a column of about ½ inch or so in length, are very conspicuous.

The main trunks and branches, as well as the petioles and main ribs of the leaves, are armed with strong, sharp spines. The large, dark green, deeply cut leaves add to the beauty of the tree. The fruit is about the size of a golf ball containing a large number of small seeds.

Macmillan, in *A Handbook of Tropical Gardening and Planting*, describes it as 'a medium-sized, quick-growing, and soft-wooded tree of Brazil, reaching a height of 40 to 50 feet.' He adds that 'this is the only species of the potato order that grows into a tree form'.

Owing to the rapidity of the growth of *Solanum macranthum*, Mr Williams thinks that it may be worth while experimenting with as a stock on which to bud the egg plant (*Solanum melongena*), and seedlings have been raised by him, with this object in view, on which buds have been inserted. Although at the time of his writing the article the buds had made good growth, it was too early for him to say definitely whether the plant will prove useful for the purpose. It may, he thinks, prove too strong a stock.

As a decorative plant *Solanum macranthum*, or, as Macmillan calls it in the book referred to above, 'tree potato', is meeting with great admiration in Trinidad, and the first batch of seedlings raised have already been disposed of to numerous people. Owing to the prolific way, however, in which it produces seed, and the easy manner in which seedlings can be raised, there is no trouble in supplying plants. Several plants are now established in various parts of the Royal Botanic Gardens, Trinidad. Probably trees of this species do not live many years.

For ornamental purposes this tree would seem well worth being introduced into others of these West Indies, although perhaps it is already found in some of them. In the Annual Report on the Agricultural Department, St. Vincent, 1908-9, it is stated that '*Solanum robustum*, seeds of which were received last year from Uganda, flowered. It promises to be a most useful decorative plant. The flowers resemble those of *S. Wendlandii*, although they are of a somewhat darker shade.' Mr. Williams, however, thinks that there may be some mistake in the name given to the plant in St. Vincent, owing to the fact that a plant was brought from St. Vincent under the name *S. robustum* by Sir Norman Lamont in 1912, which flowered freely at Sir Norman's residence, Palmiste. This appears to be the same as the plant described above under the name of *S. macranthum*. Two descriptions of *S robustum* state that it is a plant growing from 2 to 5 feet in height, and having a white corolla. This is certainly not the description of the plant growing at Palmiste. Therefore, as Sir Norman Lamont obtained his plant from St. Vincent, it is probable that *S. macranthum* has already been introduced in that island under the name *S. robustum*.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The following report on the London drug and spice market for the month of December has been received from Mr. J. R. Jackson, A.L.S.:—

The month of December opened with a very quiet market, especially with regard to products for home consumption. The supplies have been good, and prices generally have been very slightly altered from those prevailing in our report for November. As the month of December advanced, with the near advent of Christmas, and the stock-taking season, but little improvement was to be anticipated. With regard to prices, there has been a general downward tendency, and with the removal of embargoes on so many products that have formed important constituents in the manufacture of munitions, the markets have been in a more or less disturbed condition, which, it is hoped, will be fully restored with the advent of the New Year, and the declaration of peace. The following are the principal items of interest.

SARSAPARILLA.

In the early part of the month the quotations for sarsaparilla were as follows: red Native Jamaica, 2*s.* to 2*s.* 3*d.* per lb., and good fibrous Lima-Jamacia 4*s.* 6*d.* per lb. No quotations were given for other kinds, but toward the end of the month it was stated that the arrivals in London from Jamaica amounted to 198 bales of all kinds, besides 40 bales that had arrived at Liverpool.

CITRIC ACID, PIMENTO, KOLA, TAMARIND, and LIME JUICE.

At the beginning of the month citric acid was quoted at 4*s.* 8*d.* per lb. A fortnight later a slight advance was made to 4*s.* 9*d.* Pimento began with a slight decline on the previous month's rate, 6½*d.* per lb. being the price asked, which dropped to 6*d.* in the following week, and at the end of the month it had dropped to 5*d.* There has been but little demand for kola during the month, the only offerings being some 4 bags of fair bright dried St. Lucia, which were disposed of at 9*d.* per lb. At auction on the 12th of the month some 171 barrels of fair large but dried Barbados tamarinds were disposed of at 7*s.* Lime juice has arrived in good supply during the month, in the early part of which good pale West Indian was to be bought at 3*s.* 6*d.* per gallon, but there was a slight advance at the end of the month.

PLANT DISEASES.

FOOT ROT OR MAL DI GOMMA ON LIMES.

The lime tree in these islands is usually little subject to the foot rot disease, characterized by the death of the bark on the collar and the crown roots, to which some species of Citrus are very susceptible. Cases on limes have however been reported from time to time, and at present some trouble of this nature is being experienced in parts of Grenada.

The disease begins in a patch or patches, often in the hollows formed by the junction of the roots with the stem. Gum pockets are found in the neighbourhood of the cambium, there is often an exudation of gum through cracks in the bark, the bark dries up or is rotted by fungi and bacteria, and the wood is eventually left bare, and begins to decay. A sour smell usually accompanies the disease. The patch spreads around the base of the stem, and for some distance along the main roots, and the tree is slowly killed. Usually, as in other bark diseases, a thinning and yellowing of the foliage occurs, and as the encircling of the stem approaches completion, heavier crops of fruit are set.

Various fungi have been found associated with this type of disease in different parts of the world, but it is generally regarded as of non-parasitic origin. Apart from this question, there is general agreement as to the conditions under which the disease is liable to appear. Heavy or compacted soils, imperfect drainage, and too deep or too close planting are recognized as predisposing causes.

Treatment of existing cases is possible on the following lines: permanently remove sufficient soil to leave the collar and crown roots exposed. Scrape and cut away the dead bark until the patch presents a clean surface surrounded by a margin of healthy bark, and paint the whole place over with Bordeaux paste or a good wood preservative, such as is used for treating pruning cuts. Remove any low branches which interfere with the free circulation of air around the base of the tree. At the same time close attention should be given to drainage and cultivation

W. N.

THE MOTTLING DISEASE OF SUGAR CANE IN PORTO RICO.

In *Circular No. 14* of the Department of Agriculture and Industry, Porto Rico, two papers are published of great interest, considering the anxiety caused to the sugar planters through the West Indies, by the appearance of the mottling disease in Porto Rico although the disease has not yet been noted in any other of these islands. A translation of these papers from the Spanish is given below. The first is by E. D. Colon, Director of the Island Experiment Station, recording some facts established with regard to this disease. The second paper by F. S. Earle, Pathologist of the Federal Department of Agriculture, gives practical directions for the eradication of the disease.

IDENTITY WITH THE YELLOW STRIPE DISEASE.

The mottling of the cane began to claim the attention of the Porto Rico Experiment Station during the year 1915-16. It was taken for a new and undescribed disease, and as such was studied up to February 1918, when it became known in the island that Dr. H. L. Lyon, of Hawaii, was of opinion that the disease described by the Plant Pathologist of Porto Rico, Mr. J. A. Stevenson, corresponded to one already known and studied in Java and Hawaii under the name of the 'yellow stripe disease.' Recently, Dr. Lyon on a visit to Washington took the opportunity to examine specimens of mottled cane sent there from Porto Rico, and again confirmed his opinion. The Director of the Porto Rico Station has had translated the most complete description in existence of this disease, published by the Sugar Experiment Station of Java. The descriptions which are given correspond sufficiently well with the disease as known in Porto Rico.

Considering this, and seeing that there is no other cause proved, the acceptance of the identity of the 'mottling disease' with the 'yellow stripe disease' of Java and Hawaii is justified.

The idea that the Porto Rico disease was something new, and that nothing was known of it anywhere else, has constituted a great obstacle in the way of the reception of the facts in relation to it in Porto Rico and outside of Porto Rico, and is also an obstacle to undertaking with energy and confidence the campaign of eradication recommended by the Experiment Station. This obstacle is now swept away. The facts may now be considered.

(1) The characteristic mottling of the disease becomes more difficult to notice in proportion as the plant matures.

The description from Java, referred to above says that 'as the plant grows old, the clearness of the phenomenon diminishes along with its growth.'

(2) The disease reduces the tonnage of cane, and in consequence the production of sugar proportionately.

In Java one experiment gave the following results: healthy cane, first crop, 21·23 tons per acre; diseased cane, first crop, 18·20 tons per acre In Hawaii another experiment gave the following results: healthy cane, calculated tonnage per acre, 101·13 tons, giving a yield of 14·98 tons of sugar; diseased cane, calculated tonnage per acre 56·24, yield of sugar 8·43 tons.

(3) Neither manure nor water, nor intensive cultivation cures the disease.

The experience of the planters of the north and north-west coast of the island, that of the experiment stations of Central Fajardo, and of Java leave no room for doubt on this point.

(4) Disinfection of the cuttings with Bordeaux mixture, lime, formalin, or corrosive sublimate has no marked effect on diseased cuttings.

In the experiments at Central Fajardo, 100 per cent. of diseased cuttings gave 100 per cent. of diseased shoots after treatment.

(5) Some varieties of cane offer more resistance to the disease than others

According to Dr. H. L Lyon, in Hawaii the Striped, New Guinea 15, and D.1135 are very resistant. D. 433 has proved resistant in Fajardo; in experiments carried out by the Department of Agronomy of the Porto Rico Station, B.4596, B. 3412, and Yellow Caledonia have proved resistant.

(6) The disease is transmissible by vegetative reproduction; almost without exception diseased cuttings produced diseased canes.

Of the total of 623 canes growing from diseased cuttings in the experiment in Hawaii mentioned above, only three canes could be reckoned as apparently healthy. In Java an experiment was carried out with the following result. Six lots were planted completely with diseased cuttings of the variety GZ. 139. The percentage of diseased shoots on an

average of two countings of each lot was as follows: lots 1, 2, and 4, 100; lot 3, 95; lot 5, 98; lot 6, 99.

(7) The disease spreads sometimes slowly, at other times with rapidity, but it always spreads.

In the already mentioned experiment in Hawaii, 12 per cent. of the healthy canes became diseased during their growth. In another experiment made in Java, the diseased plants were counted twice on December 2 and on February 16. It appeared that in December the disease was encountered at the beginning of its growth, and in February an important increase of diseased plants was observed, rising in cases to 25 per cent.

(8) The disease is not in the soil; so that the mere fact that a field has contained diseased cane has no influence on the greater or less infection of a subsequent planting.

In Java the following results were obtained in planting the variety G.Z. 217: (1) in soil which had held diseased cane, (2) in soil which had been occupied by healthy cane, and (3) in soil which had never before been planted in cane. The percentage of diseased plants was calculated on the total number of plants in the plot. At the first cutting the percentage on soil which had borne previously healthy canes was 2·6; on soil which had borne diseased cane, 3·6; on soil which had never been planted in cane, 3·3. At the second counting the percentage was respectively 21·25, 22·35, and 16·47.

At Central Fajardo the varieties Yellow Caledonia, D. 448, D. 433, Serped, and B 3412 were planted July 31, 1918, in holes from which diseased cane had just been cut. On September 18, not one of the new shoots were diseased.

(9) Approximately the disease is widespread in the cane plantations of Porto Rico situated to the west of an imaginary line drawn from Bayamon in the north to Guanica in the south. To the east of this line only a few diseased stalks are met with on isolated plantations.

ERADICATION OF THE DISEASE.

The 'mosaic disease,' also known as the 'mottling disease, the 'Arecibo disease,' and the 'dog bite disease' is the same disease which attacks canes in Java and Hawaii, and which is known there as the 'yellow stripe disease.' This disease of the sugar cane is an infection which is transmitted in plantings made with infested cuttings. There also exists a secondary infection by which healthy plants can be rendered diseased at any stage of their growth. Probably this infection is carried by insects. The disease is not transmitted in the soil. Soils are not rendered infectious by the growth of diseased cane on them. The presence or absence of the disease depends in no degree on the kind of soil, or its preparation, or of the kind of manure employed on it.

This disease is incurable. A diseased plant remains in that condition; it may live many years, but its growth will always be slow, and its production much reduced. To eradicate this disease it is necessary to employ for planting only healthy and resistant cuttings. As far as possible, infected plants in neighbouring fields ought to be rooted up and destroyed, in order thus to achieve the elimination of contagion and to avoid a secondary infection. In districts widely infected, cuttings free from the disease will be obtained with difficulty. In the majority of cases it would be necessary to import cuttings from other districts where there are no indications of the disease. That might be very expensive, and it would practically be preferable to cultivate special plots with cuttings carefully selected, to be used as nurseries for successive plantings. The cuttings for such nurseries ought to be selected while the cane remains growing in the field. As soon as the leaves begin to fall it is very difficult to distinguish a diseased plant from a healthy one.

By chance some healthy plants may be seen in fields most conspicuously infected. These instances are entirely accidental, but doubtless they represent a greater or less immunity to the disease.

The best of these healthy canes in fields badly infected ought to be selected and used for the planting of nurseries for supplying others, and for the cuttings for the next planting. Such nurseries ought to be located as far as possible from the fields where diseased canes have been planted, and to windward of such fields. When the cuttings have germinated the nurseries ought to be carefully inspected, and diseased cuttings which may have been accidentally planted ought to be rooted out. These inspections should be continued, if possible, every two weeks during the period of growth, for the purpose of discovering and eradicating every case of secondary infection which may appear. If attention is devoted to carry this out carefully, a nursery of absolutely healthy canes will be obtained, which will assure health of the next planting. The plots for the above mentioned nurseries ought to be prepared close together, to the windward of the plantation. They ought not to be dispersed among fields of infected cane. They ought to be inspected frequently in order to be sure that all secondary infections may be immediately noticed.

If these directions are followed rigidly and completely, an entire district can be freed from this disease in the short space of two or three years. There are only two things to be done, and the one is as important as the other:

(1) Always plant the healthiest cuttings which can be obtained. Never plant infected cuttings, and the propagation of the disease will be controlled.

(2) Inspect the fields frequently. Eradicate the contaminated cuttings sown accidentally, and keep a watch for cases of secondary infection.

In order to control the disease, it is necessary to destroy the source of infection. As the infection is not in the soil, the problem is simplified; attention must be focussed on the plant. As the disease is transmissible, diseased cuttings must not be planted. As the disease is widespread to the west of the imaginary line from Bayamon to Guanica, care must be taken not to use cuttings from that region. In order to avoid the use of doubtful plants, cuttings ought to be made while the cane is in growth. As the disease is propagated from diseased plants to healthy plants, the fields must be inspected continually, the diseased plants eradicated and burnt, and fresh cuttings supplied, since it is conceded that the infection is not in the soil. As the mottling disease is more easily distinguished in young plants, and as at this period there is opportunity for replanting, examination should always be made preferably of the young plants.

In order to offset as much as possible the financial losses sustained lately in connexion with their coffee plantations, the planters in Southern Brazil are busily engaged in arranging for planting cotton instead, the prices now obtained for this product maintaining at present a continual upward tendency. Enormous tracts of land in São Paulo and neighbouring districts are suitable for cotton growing, and there is every reason to believe that the production of this article during the next year or two will amount to unprecedented quantities. That this will cause a great reduction in the present quotations there is no doubt but what is doubtful is whether the price will descend low enough to allow for exportations to foreign countries, such as Great Britain. In that case the only outlet will be to sell to the national weaving mills. (The *Chamber of Commerce Journal*, December 1918.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, January 9.

BALATA—Venezuelan Block, no quotations; Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 90/-; Grenada, 85/-; Jamaica, no quotations.
COPRA—£46.
HONEY—West Indian, no quotations.
LIME JUICE—Raw, 3/- to 3/6; concentrated, no quotations.
PIMENTO—No quotations.
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD, January 21, 1919.

BAY OIL—Firm, at 18*s.* to 20*s.*; Lime Oil—Slow, at 5*s.* 6*d.* to 6*s.* for West Indian distilled, and 16*s.* to 17*s.* for hand Oil—West Indian commands 8*s.* to 8*s.* 6*d.* per lb.

Barbados.—Messrs. T. S. GARRAWAY & Co., February 8.

ARROWROOT—$10·00 per 100 lb.
CACAO—$17·13 per 100 lb.
COCO-NUTS—$32·50 husked nuts.
HAY—No quotations.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations
SUGAR—Dark Crystals, $5·50.

Trinidad.—Messrs GORDON, GRANT & Co., February 8.

CACAO—Venezuelan, $20·50 to $21·00; Trinidad, $20·00 to $22·00.
COCO-NUT OIL—$1·50 per gallon.
COFFEE—Venezuelan, 20c. per lb.
COPRA—No quotations.
DHAL—No quotations.
ONIONS—$3·00 to $3·50 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $3·50 per 100 lb.
RICE—Yellow, $13·00 to $14·00; White, 7·50 to $8·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs GILLESPIE BROS & Co., February 4

CACAO—Caracas, 18c. to 18¼c.; Grenada, 17c. to 17¼c. Trinidad, 18c. to 18½c.; Jamaica, 16½c.
COCO-NUTS—Jamaica selects, $50·00; Trinidad culls, $26·00 to $27·00 per M.
COFFEE—Jamaica, 17½c. to 19½c. per lb.
GINGER—17½c. to 20c. per lb.
GOAT SKINS—Jamaica 90c.; Antigua and Barbados, 85c. St. Thomas and St. Kitts, 85c.
GRAPE FRUIT—Jamaica, $3·00 to $3·50.
LIMES—Nominal $6·00 to $6·50.
MACE—43c. to 45c. per lb.
NUTMEGS—27c. to 28c.
ORANGES—$3·00 to $3·50.
PIMENTO—8½c. per lb.
SUGAR—Centrifugals, 96°, 6·90c; Muscovados, 89°, 5·40c; Molasses, 89°, 5·785c. all duty paid.

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AGRICULTURAL NEWS

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	PAGE		PAGE.
Agricultural Experiment Station, St. Croix	72	Departmental Reports	79
Agriculture in Barbados	75	Formosa, Sugar Industry in	69
Ankylostomiasis, Treatment of	71	Ginger, Wild	73
Bacteria, Nature of	78	Gleanings	76
Bookshelf	71	Insect Notes:—	
Camphor Cultivation in Florida	67	Miscellaneous Insects	74
Chlorosis of Sugar-cane	68	Items of Local Interest	74
Cotton:—		Lint Length in Cotton, Relation of to Rainfall	73
A Remarkable Upland Variety of Cotton	72	Market Reports	80
Cotton Planting: Two Plants versus One Plant per Hole	70	Notes and Comments	72
Sea Island Cotton Market	70	Plants Affecting the Sense of Taste	77
Cowpea, Notes on Inheritance in the	68	St. Vincent, Preservation of Foodstuffs in	77
Department News	70	Sarawak Bean (Dolichos Hosei)	72
		Sulphate of Ammonia and Nitrate of Soda, Combined Use of	75
		Work of the Future, The	63

The Work of the Future.

II.

IN the last issue of this Journal attention was directed to the necessity for taking definite thought with regard to the measures which must be taken in order to secure to these colonies, in face of the coming struggle consequent upon the development of new countries and the conclusion of peace, those agricultural industries upon which they are so largely dependent for their welfare.

It was pointed out that this work of securing the permanence and development of these industries, as well as the creation of new ones, involves the conscious co-operation of those concerned in the administration of the government of the colonies, as well as the efforts of the planters themselves.

The manner in which the governments concerned may, or must, manifest interest in this aspect of administration may be briefly considered, though it is obvious that no adequate statement or survey of the position can be made in advance, for the duties of any government, and the demands upon its sympathies will vary with the varying fortunes and progress of the colony concerned. However, some broad general principles may be stated.

Every colonial government endeavours to safeguard the interests of its agricultural industries by providing an Agricultural Department whose function it is to watch the course of events concerning local industries, and to assist the planters with advice with regard to any difficulties that may be experienced, and at the same time to point the way to improvements, either in existing industries, or through the introduction of new ones. Simultaneously these departments are concerned with the protection of the industries of the country from dangers that may threaten from outside; upon them largely rests the duty of preventing the introduction of new pests and diseases which may prove disastrous to agriculture. These are now commonplaces of colonial administration; they are matters which are daily becoming more and more the concern of executive officers as well as of planters

There are, however, other functions of governments to be exercised in this connexion, which are not so well understood, either by the agricultural communities in whose interests they should be exercised, or by the

executive officers whose duty it should be to develop them. These functions are those concerned with research or investigations of a more or less abstract character, upon which future developments will largely depend. Agriculture implies the practical application of many of the sciences, it might almost be said of all of the sciences, but it is imperfectly realized how little is known in some fields, and how much abstract work remains to be done before methods of practical application can be offered to the planter. In the tropics this is particularly the case, for even the limited amount of work in the way of agricultural investigation which has already been done has been conducted for the most part in temperate regions, and it is extremely unsafe in many cases to attempt to apply deductions drawn under conditions of agriculture in temperate countries to the conditions obtaining in the tropics.

It is not our purpose to enlarge now upon this matter of the duty of governments to encourage research, it is sufficient to state it; but, at the same time, it is essential to say that this function, in order to be efficient, must be exercised on a very wide basis: to be effective, research, such as is contemplated, must have a very wide outlook both as regards its problems and the time given to their solution: when this is the case the solutions themselves are likely to have wide application. This being so, the function of research is properly exercised in connexion with the administration of large countries or groups, for example in the United States it constitutes one of the cares of the Federal Government. In the case of these West Indian islands it may properly be urged that it should constitute the care and duty of the Imperial Government, and this argument may be strengthened by the consideration that the outcome of abstract agricultural research should find application, not merely in the colony in which the investigation might happen to be carried on, but may conceivably be world-wide, and be of service to colonies far removed.

These questions are of fundamental importance, and require closer consideration than can be given to them in the space of this short article; they may well be dealt with on other occasions.

We may now turn to some other aspects of the question of the outlook as regards the preservation to these islands of some of the industries of which they are already in possession, but which may be threatened by the pressure of the development of similar industries elsewhere.

Sugar occupies a large place in West Indian affairs, so attention may first be turned to this. At the present moment the sugar industry of these islands is extraordinarily prosperous, on account of the abnormally high prices being paid in consequence of the disturbance of ordinary commercial conditions by the war. This state of things can hardly last long, so that a substantial fall in price may be looked for within a measurable period of time. A general survey of sugar prospects will be of interest.

The world's consumption of sugar had risen from about 12,300,000 tons in 1903-4 to about 18,600,000 tons in 1913-14, an increase of some 630,000 tons a year during the ten years prior to the war. In this period the production of cane sugar increased from about 6,300,000 tons in 1903-4 to about 10,000,000 tons in 1913-14, an increase of some 370,000 tons a year. During this period the production of beet sugar increased from some 6,000,000 tons to about 8,600,000 tons, an annual increase of 260,000 tons. The production of cane sugar was increasing at a greater rate than that of beet sugar. If, however, regard is had to the production of cane sugar during the six years from 1910-11 to 1916-17, during which time the rate of increase has been very uniform, it is found that the annual increase in the production of cane sugar amounts to some 740,000 tons: this figure, doubtless, better represents the activity current in cane-sugar producing countries. The effect of this greatly increased production of cane sugar upon the price of the commodity depends upon the rate at which the world's consumption of sugar increases, and also upon the extent to which the production of beet sugar may recover the ground lost by the disturbances resulting from the war. It is thought that the general indication is that the rate of production of sugar generally is fully up to the rate of consumption, and that the stimulus of high prices, and the possibilities of developments in new countries, together with the restriction of consumption due to high prices, point to keen competition, with the consequent lowering of prices, and that this will take place at no distant date.

In order to meet competition, it will be essential for those concerned with the West Indian sugar industry to use every effort to make their production, both in field and factory, as efficient as possible. This means unceasing attention to all agricultural problems, as well as to those processes of manufacture which at the moment are receiving unwonted attention.

As regards manufacture, it will be necessary to bring the recovery of sugar from the cane up to a point

comparable with the excellent work done in Hawaii, Java, and other advanced countries. This has been achieved in the case of a few British West Indian factories, but some are yet far below the required standard of efficiency, while many, from lack of records, are in ignorance of their condition in this respect. Competition will find out the weak places, and only the competent will be able to survive with comfort.

In connexion with this question of efficiency in sugar making it may be pointed out that, in the near future, it is probable that new developments will materially alter the aspect of things, and call for the exercise of technical skill in an increasing degree in order to meet these new demands. Just what these developments will be it is not easy to predict, for new conditions give rise to new problems; but there are some which are casting their shadows before. It is more than probable that there will be a great increase in the tropics in the production of sugar of a kind that will go directly into consumption without the intervention of the refiner, and that, in consequence, there will be competition between the tropical sugar maker and the refiner. The manufacture of sugars for direct consumption will demand a high degree of technical skill on the part of the tropical sugar maker, and the rewards of success will go to the more skilful and better equipped in this direction.

Another feature which may call for the exercise of a high degree of technical skill on the part of the tropical sugar maker is the possibility that the refiner will be more exacting in his demands in regard to the quality of sugar which he requires, and that he will qualify the simple polariscopic test, upon which he has hitherto been content to buy his sugar, by others which will measure the quality of the sugar in other directions. Already discussions have taken place concerning the desirability of supplementing the polariscopic test by others which take into account such things as the freedom from dirt, the size and hardness of the grain or crystal, the freedom from fermentive organisms, the percentage of moisture, and other points. Should these changes be adopted, they will call for the exercise of a considerable increase in technical knowledge and skill on the part of the makers of sugar; and, here again, success will go to the efficient.

At this stage it may be well to ask—where are the sugar makers in these small colonies to learn the necessary efficiency? At present they have to wait for the progress of developments in other and often distant countries and then endeavour to copy these—a condition of affairs which implies being always somewhat behind in the race, and always being, to that extent, inefficient.

It will be admitted, then, that those whose concern is with sugar have need for organized vigilance.

CAMPHOR CULTIVATION IN FLORIDA.

An article in the *Perfumery and Essential Oil Record*, January 1919, gives some interesting details of the cultivation of the camphor trees in Florida. It appears that about thirty-five years ago the United States Government imported from Japan a quantity of camphor berries, and distributed them among certain portions of the country where the climate appeared to be favourable to their growth. Many healthy and flourishing trees have been raised from this seed. About fourteen years ago, when diminished camphor supplies from China and Japan seemed to be certain, the United States Department of Agriculture pushed the development of camphor tree plantations in Florida. One company purchased a tract of 3,000 acres in that State on which there is to-day a well developed area of camphor trees of varying ages.

In 1913 another company decided, after thorough investigation, to begin extensive plantations of camphor trees. A tract of land of about 12,000 acres was purchased, the first land cleared in June 1914, and in November of the same year the first seed-bed was planted.

In the cultivation of camphor, the camphor seeds or berries are first planted in specially prepared beds. After a year's growth they ought to be of sufficient size and strength to transplant into the open fields. The process of transplanting consists first in cutting the seedling taproot about 10 inches below the surface of the soil then removing the seedlings from the soil, trimming off the lateral roots, trimming away all the foliage, and cutting back the main stem of the seedling to about 3 inches above the soil line, and setting the trimmed plants out in the fields. At first it was considered that the most satisfactory method of planting the trees was approximately $7\frac{1}{2}$ to 8 feet apart. It was found later on, however, that camphor trees could be planted very close together so as to form a perfect hedge. Accordingly succeeding plantings have been $3\frac{1}{2}$ to 4 feet apart in the rows.

About four years from the time of transplanting, the trees can first be pruned, and as they grow, the solid hedge is shaped and developed by pruning with an expected increase in yield of pruning per acre each succeeding year.

The camphor tree grown in this way in Florida has proved to be extremely hardy, although the effect of frost is temporarily prejudicial, causing a decrease in the growth of foliage during the following season. Up to the present there has been very little trouble on account of insect pests.

This plan of camphor cultivation in rows of hedges, and the harvesting of the leaves and twigs once, and possibly twice, a year is expected to avoid wasteful destruction of the growth. Although the leaves and twigs are known to contain a smaller percentage of camphor than the old wood of the branches and trunks, this is compensated for by the rapid replacement of new growth. The ultimate appearance of the completed camphor groves in solid hedges running north and south promises to be one of extreme beauty. A yield is expected which will replace the dependence for camphor, vital to the productions of many industries, upon a source of supply which seems to be diminishing in the Far East.

NOTES ON INHERITANCE IN THE COWPEA.

Mr. S. C. Harland B.Sc., has furnished the following notes in conclusion of his investigations on inheritance of characters in the cowpea:—

A SYSTEM OF MULTIPLE ALLELOMORPHS.

A paper by the present writer entitled 'Multiple Allelomorphs in Vigna' has been contributed to the *Journal of Genetics*. This paper has not yet been published, but it will be convenient to give a summary of the facts recorded therein, and then to give a short résumé of further experiments which have since been made

It has been shown. (*Agricultural News*, January 25, 1919) that the black colouration of the seed-coat in cowpeas is due to a factor, B, allelomorphic to its absence, and apparently dominant over all other seed-coat colours. B also manifests itself by the production of a purple tip to the young pod, and by the development of a varying amount of anthocyanin pigmentation in calyx and peduncle. In the absence of B, the seed is devoid of black, and the young pod, calyx, and peduncle are uniformly green. Thus, in crosses involving B and its corresponding allelomorph, it is possible to pick out all the black-seeded plants by simple inspection of the calyx or young pod.

There is another factor which affects the tip of the young pod and also the calyx and peduncle in a similar manner to B. This factor, P, has apparently no effect on the seed-coat colour, but it causes the uniform production of an intense purple colour in the ripe pod P is allelomorphic to its absence, i.e. to the same type that is the recessive of B.

Experiments were carried out to determine the relation of B to P. The following is a summary of the results:—

Cross — B (Black in seed-coat, young pod purple-tipped, calyx and peduncle reddened) by P (No black in seed-coat, young pod purple tipped, calyx and peduncle reddened, ripe pod maroon).

The F_1.

The F_1 plants had the following characters: black seed, purple tipped pod, reddened calyx and peduncle, and maroon ripe pod

The F_2.

In F_2, both the parental types appeared, together with the F_1 type, but no further combinations were produced.

Families.	Plants.	B P.	B p.	b P.
7	273	168	40	65

Here the ratio of B to b is 208 to 65, with expectation 205 to 68 on a 3 to 1 basis. The ratio of P to p is 233 to 40 with, expectation 205 to 68.

The F_3.

Forty-two families were grown in F_3. The results are tabulated below:—

Phenotypic form of F_2 parent.	Number of families.	Number of plants.	B P.	B p.	b P.
B P	14	556	305	129	122
B p	5	181		181	
b P	23	1,036			1,036
Expectation on 2 : 1 : 1 ratio.			278	139	139
Ratio B to b	434	122			
P to p	427	29			
Expectation	417	139			

The main point brought out by the above table is that is is impossible to get a plant homozygous for both B and P, i.e. these two factors completely repel each other in gametogenesis

On the chromosome hypothesis of Morgan and his associates, the genes B and P are assumed either to occupy identical loci in homologous chromosomes or to occupy loci so close together that crossing-over does not occur.

RELATION OF THE NEW ERA FACTOR E TO THE FACTOR FOR BLACK, B.

In a previous note by the present writer an account was given of the New Era factor, E. This factor is allelomorphic to the type which has just been referred to as allelomorphic to B and to P. E manifests itself by the production of the characteristic New Era pattern on the seed-coat, and also by a similar, but less intense reddening of the calyx, peduncle, and tip of young pod, to that produced by B and P.

A cross was made between Black (B) and New Era (E). The F_1 showed complete dominance of B, while in the F_2 the ratio 9BE : 3Be : 3 : Ibe was not obtained. Segregation occurred into Black and New Era in the 3:1 ratio, the numbers obtained being 84 Black and 27 New Era (expectation 83·25:27·75). The relation between B and E is thus similar to that between B and P, i.e. B and E behave as an allelomorphic pair.

Summary and discussion.

Three factors—B, P, and E—have been shown to be dominant and allelomorphic to the triple recessive type bpe Complete repulsion exists between B and P, and between B and E, i.e. these pairs of factors behave as though allelomorphic. The conditions are thus fulfilled for a quadruple system of allelomorphs analogous to the quadruple mouse series, and to the septuple Drosophila series. The most striking feature of the present case is that the three dominant genes B, P, and E, all manifest themselves by the production of anthocyanin colouration in calyx, peduncle, and tip of young pod.

CHLOROSIS OF SUGAR-CANE.

In an article contributed to the *West Indian Bulletin*, Vol. XVI, p. 137, Dr. H. A. Tempany, D.Sc., recorded results of his investigations on what are known in Antigua, as 'gall patches', which are unable to grow satisfactory crops of sugar-cane, the canes planted on them usually assuming a characteristic chlorotic appearance, and frequently dying out after a time. These patches occur in the limestone districts of Antigua but examination of the soil gave definite evidence that gall patches were not due, as has been suggested, to the presence of an excessive amount of calcium carbonate. The results of Dr. Tempany's experiments led him to the conclusion that the chlorosis of plants, especially canes, on such patches was due to the presence of sodium carbonate in the soil, the origin of this sodium carbonate being attributable to interaction between the calcium carbonate and the sodium chloride dissolved in soil water, and brought up from saliniferous deposits at deeper levels.

In the Report of the Porto Rico Agricultural Experiment Station 1917, a series of similar experiments on chlorosis of sugar-cane is described and discussed. In the southern parts of the island there are numerous areas, varying in size from a few square yards to an acre or more, where sugar-cane suffers more or less from chlorosis.

In the most pronounced cases of this chlorosis the leaves are of normal size, but creamy white in colour. Canes so

In a few cases the chlorosis appears in the same spot year after year, and many of these areas are no longer planted in cane.

As in Antigua, there was an idea in Porto Rico that this condition was due to excessive amounts of carbonate of lime in the soil. The Porto Rico report, however, states that after many soil analyses had been made it was evident that there was no correspondence between the chlorosis of the cane and the amount of carbonate of lime in the soils. While chlorotic cane, it is true, was found only on markedly calcareous soils, all calcareous soils did not produce chlorotic cane.

It has been found in Hawaii that chlorosis of pine-apples was associated, in part at least, with a lack of iron in the plants. Accordingly ash analyses of green and chlorotic cane leaves were made for the purpose of comparison as to their contents of iron, and the conclusion from these ash analyses is that the chlorosis of sugar-cane in Porto Rico is caused or accompanied by a lack of iron in the plants, owing perhaps to the fact that the carbonate of lime lowers the availability of iron in the soil.

The results of the treatment of chlorotic cane with applications of iron apparently substantiate the conclusion arrived at as to the cause of the condition. One experiment was made by brushing over the white leaves of two stools of affected cane three or four times with a 5-per cent. solution of ferrous sulphate. These stools soon became green, presenting a strong contrast to surrounding chlorotic stools.

A field experiment on a uniform piece of chlorotic cane was started in 1911 in five plots. The special treatments of the plots were as follows: (1) check, no special treatment; (2) ferrous sulphate applied to the soil at the rate of 100 lb. per acre; (3) stable manure with 5 per cent. its weight of ferrous sulphate applied to the soil at the rate of 10 tons per acre; (4) stable manure applied to the soil at the rate of 10 tons per acre; (5) canes sprayed three times with a 5-per cent. solution of ferrous sulphate at intervals of two months.

The results made it apparent that ferrous sulphate mixed with stable manure was the best treatment, being superior to manure alone or to ferrous sulphate alone, which latter gave no better results than the check plot. So long as the plots receiving ferrous sulphate on the leaves could be sprayed, these were among the best, but when the treatment had to be discontinued the plots fell behind. It appears, therefore, that spraying with ferrous sulphate, to be effective, must be done frequently and continuously, and it is therefore not commercially feasible.

The yields of the plot when reaped showed that the application of manure with 10 per cent. ferrous sulphate was the only application producing a considerable increase in yield. The increase, however, was not sufficiently large to make the treatment profitable when the price of sugar is low.

With regard to the removal or amelioration of chlorosis of sugar-cane, Dr. Tempany, in the paper referred to above, considered that under Antigua conditions it could only be effected by a large-scale system of irrigation, although it was possible that some improvement might be effected by means of applications of calcium sulphate.

THE SUGAR INDUSTRY IN FORMOSA

In an article translated from *Sugar Industry*, a Japanese paper issued in Formosa, the *International Sugar Journal*, January 1919, gives a survey of the sugar industry in that far-eastern island.

Since 1902, when the Government of Formosa adopted an active policy of encouraging sugar-cane growing, the industry which had previously been in a very primitive condition has made remarkable progress. There are at present thirty-four factories of modern type operating in different parts of the island and capable of dealing with a total daily amount of 29,710 tons of cane; there are also thirty-five improved mills with a total daily capacity of 2,870 tons. In addition, there are 258 old native mills. In order to improve methods of cultivation and conditions of manufacture, the cane planters and factory owners are combining to institute careful studies of the cane in all its aspects, cultivation, fertilization, irrigation, manufacture, etc.

In the early days of this century a Hawaiian variety of cane known as Rose Bamboo, was introduced in quantities, with a view of replacing the native variety by a superior and more productive one. Unfortunately this imported cane has proved not to be suitable for Formosa, being unable to withstand the strong winds which prevail there, and being not sufficiently resistant to local pests.

In order to secure a new seedling cane that could be recommended as a standard one for Formosa conditions, the Government sugar experimental stations have for some time past carried on experiments with many varieties of canes which have been introduced from various sugar-producing countries of the world. Up to the present a Java seedling cane appears to have given the best results, and this is now recommended as being well adapted for local conditions. Its distribution through the island is being generally promoted, and probably in a few years it will completely take the place of the Rose Bamboo variety.

Irrigation, draining, and other necessary works are being carried out on a large scale in various localities so as to make both dry and wet tracts of land available for cane growing. For example, in one district a project is being initiated for constructing canals capable of irrigating an area of nearly 359,500 acres.

The centrifugal sugar manufacture in Formosa has evidently a great feature in store for itself. It is possible that the existing plants, if worked to their full capacity, could turn out a very large tonnage, although the output for the last season was considerably less than what was possible. In addition to the above, the factories have also capacity for turning out a large quantity of brown sugar.

It is true that it may be a long time before the sugar industry of Formosa can be placed in the same rank as that of Java to-day. It will not, however, be a difficult thing in the near future for Formosa to produce sufficient sugar for the markets of the Far East, if the improvement in cultivation and manufacture of the last few years is continued.

The *Louisiana Planter* for December 28, 1918, notes that during the past year the Department of Agriculture has been investigating syrup making. The cane juice without lime or sulphur is mixed with Kieselguhr (an infusorial earth), boiled, and filtered through presses. The product is a remarkably clear and brilliant juice. This is then treated with a certain amount of invertase (the ferment which acts on sucrose) at a temperature somewhat below 50° C., under which conditions the sucrose changes over almost completely to invert sugar. The product may then be evaporated to any desired density without fermentation or crystallization. The syrup thus produced, is sterile dense, and of good flavour. The process is said to be cheap enough to be commercially practical. The syrup may be kept without fear of fermentation when bottled or canned

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended February 8, 1919, is as follows:—

ISLANDS. There continued a good demand throughout the week for the odd bags classing Fine to Fully Fine, resulting in large sales, the buying being on account of the Northern Mills. The Exchange reported sales for the week of 2,600 bales, but they exceeded 3,000 bales, taking the larger part of the stock of this quality.

At prices now current Fine to Fully Fine Islands are attracting general attention, the quality being fully equal to and better than Georgias and Floridas in grade, staple, and fineness.

We quote, viz:—

Fine to Fully Fine, 53½c. to 54c., f.o.b. and freight.
Fine to Fully Fine, slightly off in preparation, 52c. to 52½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. The Savannah market remains dull, with Factors holding off the market the old crop cotton, of which their stock principally consists.

The demand continues in the interior markets, where the holders are willing sellers at quotations.

The sales of 1,185 bales reported by the Savannah Cotton Exchange represent cotton passing through from the interior markets.

You will note that there has been a good demand on account of the Northern Mills at some concession in price.

We quote viz :—

Extra Choice, 53c., f.o b. and freight.
Average Extra Choice 52c. to 52½c., f.o.b. and freight.

The exports from Savannah for the week have been: to Northern Mills, 1,336 bales, and from Jacksonville to Northern Mills 146 bales.

COTTON PLANTING: TWO PLANTS VERSUS ONE PLANT PER HOLE.

Reference to Pamphlet No. 31, *The A.B.C. of Cotton Planting* issued by the Imperial Department of Agriculture for the West Indies, will show that the advice given to cotton planters is to plant four seeds in a hole, and then to thin the seedlings out so as to leave only one plant *in situ*. This advice has been consistently advocated until quite recently in most, if not all, of the cotton growing islands In the last few years, however doubts have arisen, notably in St. Vincent and Montserrat, as to the advisability of adhering strictly to this practice. The results of an experiment designed to test the comparative yield of one plant per hole as against two plants per hole were recorded in the Report on the Agricultural Department, St. Vincent, 1917-18, which showed that two plants per hole gave 27 per cent. greater yield that one plant per hole.

A similar experiment undertaken in Montserrat gave a like result; and, on being repeated during the last cotton season, 1918-19, confirmed the previous result, the average gain accruing from two plants per hole as compared with one plant per hole being about 23 per cent. Mr. Robson, the Curator, in referring to this last experiment, states that four teen rows, each 174 feet long and 4 feet apart, were planted with cotton seed in holes at a distance of 2 feet apart; the rows alternated, the odd numbers being thinned out to two plants per hole, and the even numbers to one plant per hole. In every case the rows carrying two plants per hole gave a larger yield than the others, with the average result stated above.

The following table shows how this result was attained:—

Two plants per hole.		One plant per hole.	
No. of row.	Total yield per row. lb. oz.	No. of row.	Total yield per row. lb. oz.
1	24 13⅝	2	16 10⅛
3	20 11¼	4	16 2¼
5	19 3	6	15 11½
7	17 7¾	8	15 2¼
9	19 7⅞	10	17 11⅛
11	22 3⅝	12	16 15⅞
13	22 0⅛	14	19 13

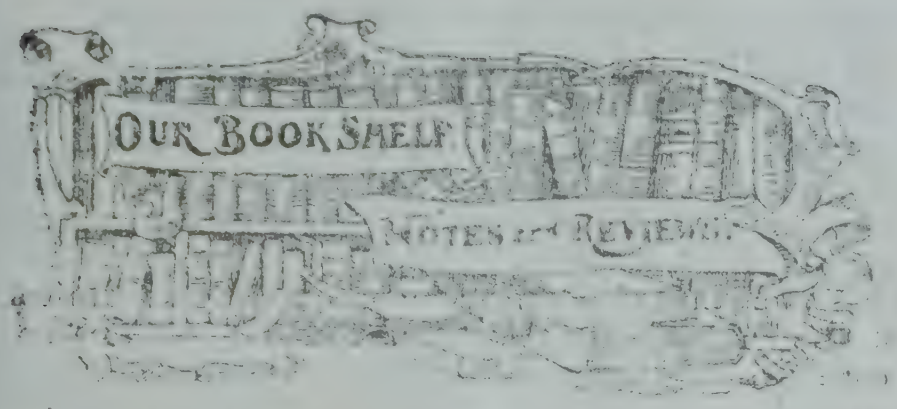
There are considerations, however, in connexion with this subject that should be well weighed, before too general a conclusion is arrived at. In the first place, as was pointed out in the St. Vincent Report, the season in which the experiment was undertaken was a very favourable one both as regards rainfall and as regards freedom from plant diseases. It still remains an open question whether the doubling of the number of the plants on a given area would be of advantage under less favourable conditions. In Montserrat also the conditions during the season in which the experiments were made seem to have been, on the whole, favourable to the cotton crop. Therefore a certain amount of caution is requisite, and further continued experiments are needed before advocating a general desertion of the practice hitherto advocated.

A second consideration must also be borne in mind. The practice of thinning out the cotton plants to one necessitates a certain amount of care and attention to the field on the part of the cotton grower. The experiments noticed above were carefully carried out; the plants were really thinned out to two, not leaving each hole to the chance of having three or four or half a dozen plants remaining in it. There is a fear that if the idea is widely adopted that more than one cotton plant may be left in a hole, a slipshod practice might obtain, whereby no thinning out would be done, the result of which, it need hardly be said, would be disastrous to the yield obtained. Further investigations will no doubt be made, and cotton growers will be glad to be placed in early possession of the results of recent experiments, but the need of continued care must always be emphasized.

DEPARTMENT NEWS.

Mr. W. Nowell, D.I.C., Mycologist on the staff of the Imperial Department of Agriculture, returned to Barbados from Grenada on March 3.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, left Barbados on March 5 for the Leeward Islands, in connexion with entomological investigations.



BLACKIE'S SENIOR TROPICAL READER. By Sir Francis Watts, K.C.M.G., D.Sc., etc., Imperial Commissioner of Agriculture for the West Indies, and Rev. C. H. Branch, B.A. Pp. 224. *Blackie & Son*, Ltd. Price 2*s*.

This Tropical Reader forms a valuable addition to the well-known series of Blackie's Tropical Readers. This volume makes it possible to place in the hands of young readers in the tropics a more advanced book than the previous issues in the series, and gives such readers an excellent idea of the relation which exists between tropical countries of the Old and the New Worlds, and those lands from which they have derived their modern civilization.

The story begins with the development of transport and gives an account of ancient caravans overland, and of early communications by sea. The development of modern transport is also discussed with regard to its relation with the development of these portions of the world.

The careful summaries of the early voyages of discovery, and their effects on geographical knowledge, and on the dissemination of knowledge regarding tropical fruits, vegetables, and other products of field and forest are particularly interesting, and should prove stimulating to students. It is also shown that the early explorers had in mind mainly the conquest of foreign lands and the acquiring of gold, silver, and precious stones, but that in the sequel of the discovery and exploration of the tropics has resulted in the accumulation of wealth in quite a different way from what these pioneers expected.

Field and forest have contributed to this accumulation of wealth. The discovery and exploration of tropic lands have resulted in many new plant products being brought into use, and in many of those longer known being placed within the reach of a much larger class of consumers. Maize and rice among the cereals, the potato and sweet potato amongst the vegetables, camphor, oils of many kinds, spices, perfumes, and fruits, which are now in common use in all parts of the world, testify to the results of the exploitation of the tropics.

During the great world war three tropical products have played a most prominent part, and in this connexion the accounts given of sugar, cotton, and rubber should prove of interest to all readers.

This book naturally deals to a very large extent with agricultural subjects, because agricultural products have played a greater part in the influence of the tropics on the rest of the world than have their mineral resources, and perhaps also because Sir Francis Watts is an eminent agriculturist. The Senior Tropical Reader, however, should fill a very useful place in connexion with the study of history, geography, and of the tropics, for schools in all countries. It would seem that a book like this, while primarily intended for use in the tropics, would also be particularly valuable for use in temperate countries

When used as at first intended, it is an excellent means of giving the student an idea of the relation which exists between the tropical countries and the rest of the world. but for the student in temperate countries it would seem to possess all the charm of romance in dealing with historical and geographical subjects. To most children the tropics are a sort of wonderland, and stories of discoveries and explorations, and of the cultivation of the various crops which yield well known tropical products are always of interest.

In size this book is quite convenient, the last few pages being devoted to useful notes which explain many points in connexion with the text. The paper and letter-press are good, the information concise and accurate, but the illustrations leave something to be desired. Some are good, some are indifferent, and others decidedly poor. It is to be hoped that in another edition better illustrations will be provided.

The chapter on health in the tropics only includes four pages. This might have been extended considerably. When it is realized that many places in the tropics which are now productive, and which are now relatively healthy for persons of European races to live in, which insect-borne diseases formerly made absolutely deadly, an idea may be obtained of what might be said on the control of disease-carrying insects, and of the various animal parasites which used to prove so inimical to Europeans in the tropics. The construction of the Panama Canal depended in the first instance on the control of the insects which disseminated malaria and yellow fever. In a later edition this chapter might be considerably extended.

On the whole, the defects of this little book are few; its many good points completely outbalance them, and we believe that much good might be accomplished if it were in the hands of juvenile readers in all parts of the world, temperate regions as well as tropical.

H.A.B.

THE TREATMENT OF ANKYLOSTOMIASIS BY OIL OF CHENOPODIUM.

A note on another page of this issue draws attention to the successful treatment of hookworm disease or ankylostomiasis in the Seychelles. A report from Fiji, referred to in the *Colonial Journal*, October 1918, states that there are many valid reasons why oil of Chenopodium or American worm seed should supersede thymol in the treatment of hookworm disease. Oil of Chenopodium is less toxic, is more efficient, and is not so costly.

It may be mentioned that *Chenopodium ambrosioides*, the plant from the seeds of which the medicinal oil is obtained, grows wild in most of the West Indian islands, and is commonly used as a vermifuge. The whole plant has a distinct smell of the oil.

The good results obtained in Fiji by the use of this oil are attributed to the methods of administration employed. In the afternoon before, a dose of magnesium sulphate is administered to the patient. At seven o'clock the next morning one-half of the dose of chenopodium oil is administered. At nine o'clock the remaining half of the oil is administered, and at eleven o'clock a second dose of salts. The person is advised to partake of but little solid food until after the action of the second dose of salts. According to the age and sex of the individual the dose varies from 3 drops for an infant to 60 drops for a grown man, each dose being divided into two equal parts. These doses apply to the first two treatments, and are slightly increased for those having to be treated again.

The writer of the report states that he does not doubt but that the percentage of cures with one treatment might practically reach 100 per cent, if the diet, the salts, and the amount of the dose of the oil of chenopodium were properly adjusted.

EDITORIAL: NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial continues the subject of the work of the future in the West Indies, especially with regard to the sugar industry.

Under Insect Notes, on page 74, will be found descriptions of some insects occurring in these islands, which have been recently identified.

On page 78 an article on bacteria will probably be of interest.

The question of the advisability of allowing two cotton plants to grow in one hole is discussed on page 70.

Agricultural Experiment Station, St. Croix.

The United States Department of Agriculture has definitely assumed control, from the beginning of this year, of the Agricultural Experiment Station in St. Croix. Dr. Longfield Smith, who was for some years under the Danish régime Director of Agriculture in St. Croix, has now been appointed Agronomist-in-Charge of the station in connexion with the United States Department of Agriculture. We wish him continued success amid his old surroundings, under is new title.

A Remarkable Upland Variety of Cotton.

In the Annual Report of the Chief of the Bureau of Plant Industry, United States Department of Agriculture, for the year ended June 30, 1917, there was a note on a new variety of Upland cotton called Meade. It was stated that, possessing the more rapid and prolific fruiting habit of Upland cotton, this variety has been developed with lint scarcely distinguishable in texture and length of fibre from that produced by the Sea Island cotton of Georgia and Florida.

The subject is also noticed in the report of the Acting Chief of the Bureau of Plant Industry for the year ended June 1918. In the report of 1917 it is stated that the continued production of Sea Island cotton in Georgia, and Florida seems precarious, on account of the ravages of the boll weevil. The development, however of the Meade variety, the report of 1918 states, may make it possible to maintain the production of extra staple cotton in the South-Eastern States. The Meade cotton is much earlier than the Sea Island, and has yielded more than twice as much in alternate planting with Sea Island under weevil conditions. The fibre attains a length of $1\frac{1}{2}$ inches or more, under favourable conditions. The crop is harvested in the same manner, and ginned with the same machinery as Sea Island, so that the substitution would cause no change in the customary methods of handling Sea Island cotton either at the ginnery or on the market. The Meade cotton was sold at Savannah on the same footing as Sea Island. The percentage of lint, it is true, is low because of the larger seeds, but the percentage of oil is correspondingly high. Supplies of pure seed are being increased as rapidly as possible, and enough was available for planting about 500 acres under the new variety in the season of 1918.

Sarawak Bean (Dolichos Hosei).

A note in the *Agricultural News*, Vol. XVII, No. 417, drew attention to the value of this bean as a cover crop in rubber plantations. Seeds of this species were distributed by the Imperial Commissioner of Agriculture for the West Indies to the Experiment Stations in several of the West Indian islands. Only in St. Lucia apparently did any of them germinate. In the report on the Agricultural Department of that island for 1917-18, the Agricultural Superintendent, Mr. A. J. Brooks, notes that *Dolichos Hosei* had spread vigorously between permanent plots of oranges, grape fruit, mangoes, etc. and had made a dense compact covering of the soil over large areas.

Recently a letter has been received by the Imperial Commissioner from Mr. O. Brown, Stann Creek, British Honduras, to whom some seeds had also been sent, which bears testimony to the value of the plant. Mr. Brown says that he planted the beans in his yard where devil's grass was very plentiful, with the result that it is slowly choking the grass out of existence, and at the same time is forming a very pretty clover-like covering of the ground. No information has at present come to hand as to whether *D. Hosei* is of value as fodder. Should this be the case, in addition to its use as a cover crop in orchards, it would appear to be suitable for cultivation in pastures in these islands.

The Combined Use of Sulphate of Ammonia and Nitrate of Soda.

It is well known that the continued use of sulphate of ammonia on soils deficient in carbonate of lime is calculated to give rise to acidity of the soil: at the same time it is also known that the continued use of nitrate of soda gives rise to an alkaline condition in the soil. The suggestion has therefore been made, that by using a mixture of sulphate of ammonia and nitrate of soda in proper proportions, a neutral condition of the soil may be maintained, so far as the use of these fertilizers is concerned.

The correct proportions to secure this result are, in round numbers, 100 lb. nitrate of soda to 78 lb. sulphate of ammonia; or 100 lb. sulphate of ammonia to 129 lb. nitrate of soda; or, approximately, 4 parts of nitrate of soda to 3 parts of sulphate of ammonia.

This practice of using a mixture of these two fertilizers has been in vogue with some planters for a number of years.

Relation of Lint Length in Cotton to Rainfall.

Mr. W. Robson, Curator of the Botanic Station, Montserrat, has forwarded to the Imperial Commissioner of Agriculture for the West Indies some results of examinations of lint length in cotton in that island, which seem to confirm the observations recorded by Mr. R. E. Kelsick in the *West Indian Bulletin*, Vol. XVII, No. 2, viz.: that in these islands the length to which cotton lint will attain in any season is dependent on the water-supply of the plant during the critical period of the development of the boll. Mr. Robson's results with regard to three types of cotton cultivated in Montserrat are tabulated as follows for the last four crops:—

Type.	1915.	1916.	1917.	1918.
H. 23	51·7 mm.	52·2 mm.	51·9 mm.	48·4 mm.
H. 9	52·3 „	53·2 „	52·1 „	48·9 „
D. 1	52·8 „	52·6 „	52·1 „	50·3 „

It is thus seen that there is a reduction of about 2 mm. in all the cottons in the present season, doubtless due to the effect of the dry weather experienced during development. The reduction, however, Mr. Robson thinks, ought not to be regarded as very serious, particularly as one of the three types was described in the present season by the British Cotton Growing Association as extra fine, long, silky staple, the actual measurements for lint length being 48 mm. on an average of forty plants, with a range of from 45 to 50 mm.—an unusual wide fluctuation for cotton of this type.

Wild Ginger.

In Watt's *Dictionary of the Economic Products of India*; it is stated that ginger (*Zingiber officinale*) is not known in a truly wild state, but that it is doubtless a native of tropical Asia where it has been cultivated, and from where the rhizomes have been exported from very remote times. From Asia it was introduced into the West Indies and has spread now throughout the warmer parts of both hemispheres. The name ginger is derived through the Greek from the ancient Sanscrit. It was known as a spice to the early Greeks and Romans. During the middle ages it is frequently mentioned in European lists of articles derived from the Far East.

In an interesting account of a journey down the Magdalena River and through the Peninsula of Goajira, undertaken at the request of the Minister of Agriculture and Commerce of the Republic of Colombia, for the purpose of studying the agricultural conditions and possibilities of the region, Mr. M. T. Dawe, F.L.S., Agricultural Adviser to the Government of Colombia, makes the interesting statement that he found ginger growing wild over extensive areas on the lower hills of the Sierra Nevada range. He thinks, therefore, that the theory that ginger was originally a native of tropical South-east Asia must be abandoned, and Colombia be considered its original habitat. This, however, would appear to be open to question, for it its quite certain that ginger was introduced by the Portuguese into Brazil as early as the middle of the sixteenth century, and it is possible that the ginger now found growing wild in Colombia is really only the descendant of plants escaped from cultivation, which have become thoroughly naturalized.

Mr. Dawe goes on to remark that this discovery is of commercial importance, owing to the fact that there are extensive wild sources of a valuable product which can be immediately exploited, and a new local industry established in the collection and preparation of the roots.

Apart from the question of the exploitation of the wild product, there arises the possibility of its cultivation, and the initiation of a new plantation industry for that part of Colombia. Ginger is well known to be fastidious as to its soil requirements, and the fact that it is found growing wild is a proof that not only the climate, but the soil is suitable to it. The rhizomes of the wild plant however, are not nearly as large as those of the cultivated ginger. Mr. Dawe adds a word of warning to intending exporters of ginger, whether wild or cultivated, to the effect that whatever method of curing and drying be employed, the rhizomes must be thoroughly dried and bleached before shipment.

INSECT NOTES.

MISCELLANEOUS INSECTS

The following notes deal with a few insects which have been sent to the United States Bureau of Entomology at Washington, and the Imperial Bureau of Entomology in London, for identification. The names of these have been received and are published with such information regarding them as is available.

ORTHOPTERA. A bright green grasshopper or katydid from St. Lucia, where it was reported as eating leaves of citrus trees. This insect was originally described from St. Bartholomew, and is recorded from Montserrat, Dominica, and St. Lucia. The insect measures $1\frac{1}{2}$ inches or more from the front of the head to the tips of the closed wings. The wings extend for more than half their length beyond the end of the body. The wings are about $\frac{1}{2}$-inch wide at their widest part.

This insect is *Turpilia punctata*, Stal. It probably occurs throughout the West Indies, but never in great numbers, and although it is sometimes found eating the leaves of citrus trees, it does not seem likely to become a serious pest.

HEMIPTERA. Three species of hemipterous insects are included among the specimens recently named. These are *Paracarnus* sp., *Anasa scorbutica*, Fab., and *Euchenopa auropicta*, Buckt.

Paracarnus sp. was collected by the Agricultural Superintendent, Grenada, who found it attacking cacao thrips. It belongs to the family Capsidae, the members of which are mostly leaf feeders, but some are predaceous. The insect is very delicate in appearance, about $\frac{1}{8}$-inch in length, brownish in colour, with semi-transparent wings. It is now recorded as a natural enemy of the cacao thrips, but up to the present time there is no evidence that it is of great value in the control of thrips.

Anasa scorbutica is found fairly commonly on *Momordica charantia*, the cucurbitaceous vine which bears the yellow pods known as 'Maiden's blush', 'Miraculous', 'lizards' food', and by other common names. The specimens which were sent away for identification came from St. Vincent, but the insect is known to occur in Grenada also, and it is probably widely distributed in the West Indies.

The tree hoppers of the hemipterous family Membracidae are peculiar looking insects on account, largely, of striking modifications of the prothorax. The one now referred to is *Euchenopa auropicta*, specimens of which are taken in St. Vincent on *Tephrosia candida*.

In this species the prothorax is extended above and forward over the head in a pointed projection. The colour of the insect is black and yellow; its length is about $\frac{5}{16}$ inch. Tree hoppers seldom become abundant enough to rank as pests.

COLEOPTERA. A small beetle was found in the hold of the schooner *Annie M. Murphy*, which arrived at Barbados last November with cotton seed to be used for oil production, and other cargo to be transhipped for the United Kingdom. On account of the presence of the pink boll worm in the cotton seed this was refused admission, and as there was considered to be a strong probability that the other cargo which consisted of bags of cassava, cassava farine, and wheat bran might carry this insect, this also was refused admission (see *Agricultural News*, Vol. XVII, p. 376).

The insect referred to was seen to occur in some abundance crawling on the bags of cassava. The beetle has been identified at the Imperial Bureau of Entomology as *Araecerus fasciculatus*, de Geer, and Dr. G. A. K. Marshall, the Director, writes as follows: 'The Araecerus is a cosmopolitan beetle which seems to attack seeds of many different kinds, although it is most generally known for the damage it does to coffee.'

HYMENOPTERA. A bright, green bee, reported to be pollinating the flowers of the egg plant in St. Vincent, has been determined to be *Augochlora antialans*, Cockerell, and a large wasp which is widely distributed in these islands and in some localities abundant, proves to be *Monedula signata*, L. This is one of the solitary wasps of the family Bembicidae. These insects catch flies for storing their underground nests.

In appearance *Monedula signata* is a large robust wasp, measuring some $\frac{7}{8}$-inch in length, and $1\frac{3}{8}$ inches in spread of wings. The body colour is black and yellow-banded, yellow predominating on the under surfaces of the body, and black on the upper.

These wasps are often to be seen about the sugar-boiling houses where they seem to be attracted by the fresh megass or the molasses. Although solitary in habit, that is each female forms her individual nest or nests in the ground in which the eggs are deposited along with the food on which the grubs are to live, they often live in large communities, in localities where the conditions are favourable for the construction of their nests. In these places they may often be seen to pounce on their prey and capture it. This species captures large flies, and sometimes eight or ten attack the same prey simultaneously with all the ferocity of eagles, and they all go to the ground together in a struggling mass.

During November last there were severe attacks of caterpillars on cowpeas and pigeon peas in Antigua and St. Kitts. In St. Kitts these caterpillars were controlled by a parasitic fungus, and in both of these islands a parasitic insect occurred which probably materially helped in checking the outbreak of caterpillars.

This has now been identified as *Coelichneumon serricornis*, Cresson. It is a wasp-like insect about $\frac{1}{2}$ inch in length, the thorax being black with fine white markings, and the abdomen red.

H. A. B.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

DOMINICA. In his notes for the month of January Mr. Jones, Curator of the Botanic Station, draws attention to special work done at the lime experiment station in cultural improvement. Surface drains have been dug amongst young lime trees, and $2\frac{1}{4}$ more acres of land, on which it is intended that limes shall be planted this year, have also been drained. The experiment plots, which now cover an area of about $4\frac{1}{2}$ acres, were also pruned. During the month the manurial plots were weeded, and phosphatic and potassic manures applied. The yield during the month from the lime experiment station was 48 barrels of limes, bringing the total crop for ten months, April 1918 to January 1919, up to 1,035 barrels of fruit. Eight bags of cacao were shipped during the month from the station to London. Plant distribution for the month consisted of: lime plants, 4,550; miscellaneous, 5; Tephrosia seeds, 15 lb.; peanuts, 5 lb.; onion seed, 60 lb.; vegetable seed, 267 packets. The weather during the month was dry, the rainfall recorded at the station being only 2·42 inches.

ANTIGUA. Mr. T. Jackson, the Curator reports that sugar-cane variety plots on various estates have been planted, and the sugar-cane nursery at Skerrets supplied Plants distributed from the station were: in January eucalyptus, 100; casuarina, 32; miscellaneous, 6; and cane plants, 36,059. The cane crop is rapidly ripening, and reaping will begin about the middle of February. Very little onion seed has been planted in the island; most of that received has been stored at the Botanic Station for use next season. It is expected that there will be a considerable decrease in the estimated yield of cotton owing to the presence of cotton stainers and boll disease to a much greater extent than in former years. Cotton purchased from peasants for the Antigua Cotton Growers' Association amounted to 2,944 lb. clean, and 546lb stain. The rainfall during the month at the Botanic Station measured 3·79 inches. In some parts of the island however, a veay heavy rainfall was experienced on January 3. In one locality several acres of cane were washed away, and some damage done to cotton fields. No reliable record of the rainfall in this locality is obtainable, but it is considered that during the night something like 8 inches of rain fell.

ST. KITTS. At the Experiment Station, La Guérite, the experimental plot of cane varieties have been planted out. All old cotton plants have been pulled up and buried. The selection of cotton seed for sale is being continued. Plant distribution during the month of January was as follows: cane cuttings, 3,900; peanuts, 18 lb.; Mazzagua guinea corn, 24 lb. Much watering was needed at the Botanic Station owing to the dry weather during the latter part of the month. Reaping the cane crop is expected to begin in the first week in February. The young cane crop is germinating well, but rain is much needed. Old cotton plants are all being rapidly turned in, and in accordance with the provision of the law, there will be a close season of six weeks in each of the three districts of the Presidency. The destruction of native food, plants of the cotton stainer is being proceeded with, and owners and managers of estates are undertaking this work at their own expense. The demand for the best seed for planting is so great that it is beyond the supply available at the Experiment Station. Good pedigree seed has, however been secured from other sources. Mr. S. C. Harland, B.Sc., Assistant for Cotton Research on the staff of the Imperial Department of Agriculture, paid a visit to St. Kitts during the month to inquire into matters concerning the raising of pedigree seed of cotton, and other matters in connexion with the cotton industry. The rainfall for the month registered at the Experiment Station was 3·26 inches.

NEVIS. Mr. W. I. Howell, the Agricultural Instructor, states that during the month of January the ground nuts in the experiment plot were reaped with good returns Large yields have also been obtained on the reaping of the sweet potato plot. The old cotton on the demonstration plot has been destroyed in preparation for the next crop. Cotton seed for distribution to small growers is being selected. With regard to the cane crop, Mr. Howell states that there will be a great increase in the acreage put under cane this year, but that labour difficulties are becoming serious on account of large emigration to San Domingo. Reaping of the cane crop has begun. With regard to cotton, the old cotton plants are being destroyed, and preparation for the next crop started on many estates. The acreage will, however, be greatly reduced on account of the shortage of labour and the prospects of good price for sugar. During the month 127 John Bull trees and eighty-seven silk-cotton trees were destroyed. The potato crop is being reaped with very good returns throughout the island, and a fair crop of yams has also been reaped. Mr. Harland visited the island and gave an address to the Agricultural and Commercial Society on the work done in St. Vincent towards eradicating the cotton stainer, and gave other advice as to cotton cultivation. The rainfall for the month was 7·22 inches.

VIRGIN ISLANDS. Mr. W. C. Fishlock notes that the onion seed arrived very late, and that in order to get as much of it planted as possible, over seventy beds have been prepared and planted at the Experiment Station, Tortola, during the month. There has been a very fair crop of cotton, and a considerable quantity of it has been sent to St. Kitts for sale. A large amount of attention is still being devoted to the cultivation of ground provisions. A very important food crop in the island of Anegada is Guinea corn, and it is reported that a good crop is now being reaped. The total rainfall recorded at the station in Tortola was 2·85 inches.

AGRICULTURE IN BARBADOS.

The drought which prevailed during the whole of January and extends into the current month was broken up on the 13th instant. The total rainfall for the showery days since the 13th instant is practically 2 inches. The change in the weather has been greatly appreciated and has relieved the tension which existed in respect to the establishing of the young crops, both canes and vegetables.

The young cane crop will now have the chance of making good its start. Planters continued supplying during the dry weather and many a plant thought to be dead sent up shoots with the first showers. Two days after the change in the weather it was surprising to see how many shoots had made their appearance. Supplying, of course, has not yet been completed, but by the end of this month little should remain to be done.

It would be ideal if the majority of fields could receive a satisfactory application of farm-yard manure at a date sufficiently early to enable the soil to absorb the chemical constituents before the plant is put in. Even a spell of dry weather during the planting season would fail to hamper the early development of the plant where nourishment had been already distributed in the soil.

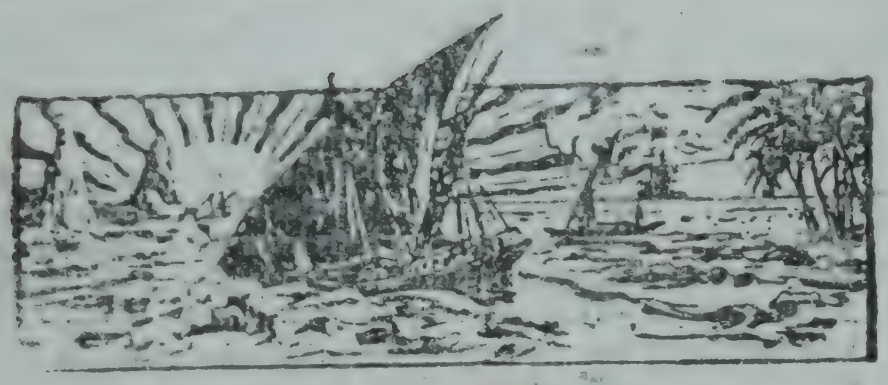
Our soil has done very fine things in the past, but to preserve its fertility after so long a period of cultivation we must pay considerable attention to manuring, tillage, and a judicious rotation of crops. The rotation of crops facilitates thorough and timely tillage, and rests the soil.

Reaping operations are in full swing in the black soil, but in the red soil, except in the case of wind-mills, grinding is not yet generally done.

There has been, as was to be expected, an improvement in the density of the juice, while the tonnage of cane per acre varies from 24 to 42. In the sea-board parishes the drought and the root beetle have considerably reduced the tonnage.

It is to be regretted that thus far so little has been done in the way of co-operation. The machinery erected would have been more modern and effective, the burden of expenditure would have been comparatively speaking small in the case of each individual, and there would have been a healthy distribution of profits. Co-operation and not competition is the life of trade, and improved conditions will always result from co-operation.

The recent rains have enabled planters to extend the area under fall potatoes and to supply fields that had been already planted. Looking to the fact that there will be a great scarcity of rice this year, every available field should be planted in ground provision of some kind. (The Barbados *Agricultural Reporter*, February 22, 1919.)



GLEANINGS.

The Commonwealth Government of Australia has purchased the entire output of sugar from Queensland both for the season 1918-19 and for that of 1919-20. The total amount of money involved in the purchase is stated to be over £16,000,000. (*The Board of Trade Journal*, October 10,

It is desirable to call attention to the harm likely to result to poultry from the use of food that contains salt in any quantity. Poultry of all kinds are very susceptible to salt, and many cases have lately been brought to light in which poultry have died from diarrhœa of a fatal type resulting from taking salt foods. (*The Field*, January 25, 1919.)

The *Daily Express*, January 13, 1919, draws attention to building of three steamers which are to have a speed of at least 15 knots for the special purpose of carying fruit from America and the West Indies to the United Kingdom. Hitherto the vessels in this trade have not for the most part been built with due regard to the necessities of this trade in perishable products—speed and ventilation—and consequently much of the fruit has been shipped in a half-ripe state.

The possibilities of Ceylon are great with regard to agriculture, but beyond the few products to which capital has been attracted the agricultural conditions are admittedly very backward. Ceylon is rapidly becoming dependent on three industries—tea, rubber, and coco-nuts—but the causes of the decline of its other products seem to need careful investigation. For instance, all the sugar required is imported, although it could be produced in the colony. (The *Colonial Journal*, October 1918.)

The general trade of Guadeloupe and its dependencies has made continual progress since the outbreak of the war. From 43,728,540 francs in 1914 it increased to 67,160,802 francs in 1916, and reached 90,070,078 francs in 1917. Such an extraordinary development, doubling the money value of the trade within four years, indicates effectively the influence of the war upon the economic position of Guadeloupe. Documentary Leaflets, International Institute of Agriculture. Rome, December 1918.)

In an account of experiments on the improvement of the date palm sugar industry in Bengal published in the *Memoirs of the Department of Agriculture in India*, Chemical Series, Vol. V, No. 3, it is stated that India produces at least 300,000 tons of sugar per year from various palms. Bengal is said to produce about 100,000 tons of this quantity European firms in Madras purchase about 25,000 tons of raw palm sugar for refining and distilling purposes annually, so that this is an industry, the annual value of whose output in normal times is roughly 2½ million pounds sterling.

The Field for January 25, 1919, remarks that many of the plant diseases for which it has become the fashion to bespeak the services of a plant pathologist are really the result of bad cultivation, and the remedy is in rational treatment and not in physic. The insects and fungi to which diseases are due become troublesome when the cultivator has, usually in ignorance, illused his plants. When the conditions of soil and climate are unsuitable, plants easily fall a prey to the first disease that comes along. Every country should grow the plants that thrive best in it.

A campaign against ankylostomiasis was started in 1917 in the Seychelles, under the auspices of the Internationaal Health Board. The campaign is being most thoroughly conducted, and is carried out by means of a house to house visitation, all who are infected being treated. It has been found that 90 per cent. of the people are infected, and the improvement owing to the treatment is already visible in the general health of the population. People of all classes have offered themelves for treatment with great keenness. (*Colonial Reports*—Annual, No. 964.)

The Director of Agriculture, Cyprus, notes in his Annual Report that during the year 1917-18 there has been a great extension of the tobacco industry in that island. This is an old industry, revived by the advent of a number of well-to-do war refugees from Syria and adjacent tobacco-growing countries, who have not only taught the Cypriots proper methods of tobacco cultivation, but have expended considerable capital in developing the industry In order, however, to safeguard the cultivation of foodstuffs, tobacco planting was only permitted by license.

It appears that unusual interest has been aroused in the production of cotton in Eastern Peru, and that the acreage is being extended. An excellent grade of cotton is being raised from Sea Island seed imported from the United States. All of this cotton has an extraordinarily long staple, while the fibre is very silky, and compares favourably with the best Sea Island and Egyptian cotton. So far, all the cotton raised has been shipped to Liverpool, but producers are now considering exportation to the United States as well (The *India Rubber World*, October 1, 1918.)

From the report of the working of co-operative credit societies in Mauritius for the year ended June 30, 1918, it appears that the number of societies in active operation was twenty-three, while the number of shareholders was 2,767. Dr. Tempany, Director of Agriculture, who is ex officio Registrar of these societies, states that he is able with satisfaction to record his opinion that their present position continues to be sound, and that the societies appear to be firmly established in the colony. Further explanation may be expected in due course, as the movement gains in strength and solidity.

In a recent drought, which lasted over two years, no appreciable rain fell on the Gilbert Islands in the Pacific. Many lives have, however, been saved by the use of condensed water. In previous times, when there was no such resource, life seems to have been sustained by the natives by drinking the vitreous humour in the eye of the flying-fish. In dry weather these flying fish (which are of a larger variety than those found in the Atlantic) can be caught in great numbers at night. It is said by the natives that only the eyes of these flying-fish contain a vitreous humour possessing the quality by which life may be sustained in times of drought if the supply is sufficient. (The *Colonial Journal*, October 1918.)

THE PRESERVATION OF FOODSTUFFS IN ST. VINCENT.

The following interesting information has been received from Mr. W. N. Sands, Agricultural Superintendent, St. Vincent. The example set may well be followed in the other islands.

In the years 1917 and 1918 the St. Vincent Government found it desirable to provide facilities at the Government Ginnery and Granary for the preservation of certain imported and locally produced articles of food. The reasons for this were:—

(1) The exportation of corn, corn meal, beans, peas and farine was prohibited so as to conserve local food supplies.

(2) The exportation of cured cacao was restricted.

(3) The opportunities for the importation of cereal foods were few, and the quantities limited.

In regard to the first reason, it was considered unwise to prohibit the exportation of these valuable food products without giving owners an opportunity of preserving their stocks from insect attack. Therefore, when the prohibition order came into effect on May 7, 1917, the Agricultural Superintendent immediately made arrangements to take them over, if so desired, and store them in bins attached to the Granary free of charge until they could be disposed of. From May 5, to August 30, 1917, 26,817 lb. of peas and 909 lb. of corn were placed in the bins. These quantities were in addition to 71,864 lb. of corn, kiln-dried, stored, and converted into meal in connexion with the Granary's co-operative purchase scheme.

With reference to the second reason, it was found that certain quantities of cured cacao, for which licences to export could not be obtained, were being rapidly destroyed by the Angoumois grain moth (*Sitotroga cereallella*), and would have to be fumigated and stored in bins if they were to be saved.

In view of the third position it was a matter of deep concern to prevent the deterioration of the limited supplies of cereal foods, more particularly rice.

Early in 1918 the Granary's bins were filled with corn so that it was necessary to recommend the erection of a special store-house in which dry food products generally could be fumigated, and stored without damage. The Colonial Engineer, in consultation with the Agricultural Superintendent, designed and erected such a building in the grounds of the Ginnery. It was originally intended that the building should be made of reinforced concrete, but it was subsequently decided to use wood with a water-proof concrete base, because the structure was immediately required and might possibly be only of temporary use. The measurement of the building was 28 feet by 12 feetby 10 feet, and it was divided into five separate compartments two measuring 12 feet by 8 feet by 10 feet, two 8 feet by 6 feet by 10 feet, and one 12 feet by 4 feet by 10 feet. Each section was self-contained, with its own door, window, and ventillator, so that if necessary, the different products could be kept apart and fumigated separately. The estimated storage capacity was 750 bags of 1 cwt. each.

The building was completed on April 31, 1918, at a cost of £162. From May 15 to February 15, the following quantities of produce have been dealt with in it: cacao, 17,071 lb.; rice, 31,910; corn, 16,007 lb. It may be mentioned that when the products were received, all were found to be attacked by grain-eating insects, which would have quickly rendered them unfit for human consumption.

The charge for storage, including fumigation with carbon bisulphide, was at the rate of 1*d.* per cwt. per week or any part thereof, and at this rate the receipts have so far amounted to £25.

Besides the above-named quantities of foodstuffs dealt with for private owners, there were also stored during the 1917-18 season in the Granary's bins, 131,228lb. of purchased corn, most of which was converted into corn meal for local use.

The quantities of foodstuffs stored for different periods from May 1917 to February 15, 1919, were as follows: peas, 26,817 lb.; rice, 31,910 lb.; corn, 219,948 lb.; cacao, 17,071 lb. Total, 295,746 lb.

This storage undoubtedly benefited the community, for besides preserving and conserving large and valuable supplies of food in the colony, and rendering them available at opportune times, it has also prevented serious monetary losses.

PLANTS AFFECTING THE SENSE OF TASTE.

In the *Agricultural News*, Vol. XVII, No. 423, attention was drawn to the extraordinary sweet effect produced on the palate by the leaves of *Stevia rebaudiana*, a plant native of Paraguay. In referring to this article the *Kew Bulletin* Nos. 8 and 9, 1918, remarks that 'as a nutrient of course the leaves could not replace sugar.'

The article referred to then goes on to notice some other plants which affect the sense of taste in curious ways. This interesting information is reproduced below:—

Several plants are known which have uncommon properties in relation to the sense of taste in human beings. *Sideroxylon dulcificum*, A. D.C., an African plant, bears oblong or oval berries about two-thirds the size of an olive, at first dull green, but changing to a dusky red as they ripen. The seeds are clothed externally by a thin, softish pulp, only slightly saccharine, yet imparting to the palate an extraordinary impression by which the most sour and acidulous substances become intensely sweet, so that citric or tartaric acids, lime juice, vinegar, and all immature fruit of a sourish character lose their unpleasant qualities, and taste as if they had been solely composed of saccharine matter. To a certain extent the duration of these effects depends upon the amount of berries chewed, and the degree of maturity they have attained. They tend to lose their peculiar principle if suffered to remain in a ripe condition for any considerable time. The natives of the Gold Coast use the berries to render their stale and acidulated 'kankies' more palatable, and in bestowing a sweetnees on sour palm-wine.

A plant with opposite properties is the Indian *Gymnema silvestre*, R. Br., a member of the Asclepiadaceae. It has a greenish flower and thick fleshy leaves, and like most of the plants of this order, it produces a milky juice. When the leaves are chewed, sweet and acid tastes cannot be perceived for some hours afterwards. Chemical analysis of the leaves and fruits shows that gymnemic acid is the substance which affects the sense of taste. This is not a glucoside, but has very weak acidic properties, and acts upon the nerves or nerve-endings of the tongue. The plant has no toxic properties and no cyanogenetic compounds have been discovered in it. A resinous substance, also of an acidic nature, which has been obtained from it, was devoid of any anti-saccharine properties.

THE NATURE OF BACTERIA.

Considering that reference is continually being made in these columns to bacteria of one kind or another, the following general description of their nature, by Mr. D. H. Jones, B.S.A., Professor of Bacteriology, Ontario Agricultural College, published as *Bulletin 365* of the Ontario Department of Agriculture, will doubtless be of interest to our readers:—

Bacteria are microscopic plants. They are the smallest forms of life known, and in order to see them it is necessary to use the highest power microscope, together with other bacteriological apparatus. Some species of bacteria are so infinitely small that they can be only just discerned even with the highest magnifying microscopes, and it is considered that there are some which are even still smaller, being too small to come within our range of vision with all the aids known to science. The average size of the more common species of bacteria is about 1-10,000 of an inch in length and 1-20,000 of an inch in breath.

In addition to being the smallest of living things, bacteria are the simplest of living things in their structure. They are unicellular, that is, their whole body consists of only one cell. The bacterial cell is composed of protoplasm enclosed in a membrane, and the whole cell is transparent.

There are four typical shapes of bacteria: (1) spherical forms known as cocci;(2) straight rod forms known as bacilli; (3) spiral forms known as spirilla; and (4) thread forms known as thread bacteria. Bacteria of any of these four types never change to either of the other types. There are many species of each type.

Bacteria absorb their food in solution through their cell membrane. The food so absorbed is utilized by the internal protoplasm of the cell, which thus increases in quantity, and following this increase in substance the cell divides in two, each cell being a complete bacterium. These two bacteria continuing to feed, again divide, and thus produce four, and so the development and multiplication goes on. Under favourable conditions of moisture, food, and warmth this growing and dividing takes place about every twenty minutes or half hour, so that in twenty-four hours we may get a progeny of ten to twenty millions of bacteria, all developed from one bacterial cell. It is this power of rapid multiplication, inducing as it does changes in the material in which the bacteria are growing, that makes bacteria so important in the economies of life, some of them being beneficial and some injurious.

Some species of bacteria have the power of motion when placed in liquids. Some of them move about like fish, others wriggle like mosquito larvae, others glide along with a snake-like motion. These movements can readily be observed when a satisfactory preparation is viewed under the high power microscope. The bacteria which have this power of motion are furnished with delicate little whips called flagella. These flagella project from the body, sometimes from the ends and sometimes from the sides, and by waving or lashing these flagella the bacteria are propelled forward or backward.

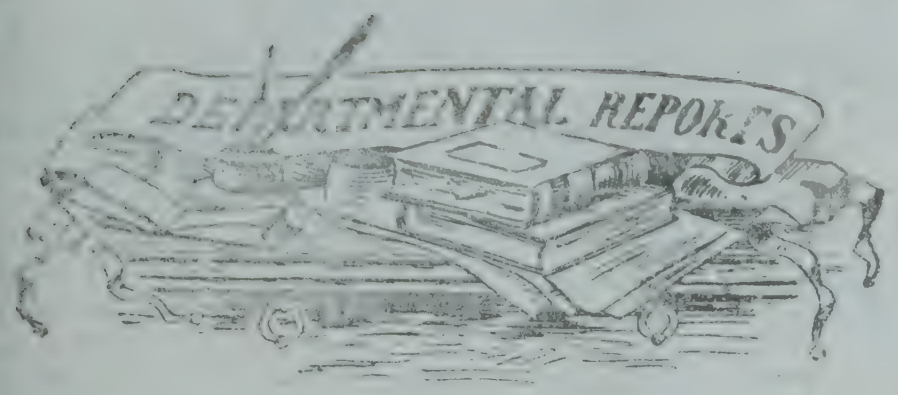
Some species of bacteria, when the food supply fails them or becomes otherwise unfavourable, go into what is known as the spore condition. That is the protoplasm within the cell membrane contracts, and condenses, and around this condensed protoplasm another membrane is produced, which is very tough and resistant. This condensed protoplasm, enclosed in its tough membrane, is the bacterial spore. These bacterial spores are very resistant to drying, heat, and disinfectants. Some of them may be boiled for an hour or two without being killed. It is the presence of such bacterial spores on meat and vegetables such as corn, peas, beans, etc., which makes it so difficult to preserve these materials satisfactorily. The spores remain dormant until the conditions around them are satisfactory for germination. Moisture, warmth, and food are the conditions which induce germination of the spores. When a spore germinates the membrane round it breaks off and the protoplasm emerges and forms a growing bacterial cell. This bacterial cell grows and multiplies until conditions again become favourable for further multiplication, and then the bacterial cells thus formed go into the spore condition. These bacterial spores are very common in soil, dust, and on the surface of anything that is exposed to a dusty atmosphere.

Some species of bacteria produce soft, gelatinous capsules around the outside of their membrane. It is these bacteria which produce the so-called ropiness in milk and bread. This ropiness is due to the development in the milk or bread of large numbers of bacteria with their capsules, and it is the sticking together of the capsules that makes the milk or bread ropy, slimy, and sticky. The gelatinous substance which grows on vinegar, and is known as mother of vinegar, is simply a mass of millions of vinegar bacteria, each one with its gelatinous capsule sticking to its neighbour.

Bacteria are found in large numbers wherever any other forms of life exist. One ounce of cultivated soil will contain millions of them in an active, growing condition. In dust they are present, usually in the spore or dormant condition. In natural waters such as rivers, lakes, ponds, wells, etc., they will be present in varying numbers according to the amount of contamination from soil surface washings and seepage. They are present in immense numbers in all decaying or putrifying organic material, whether of vegetable or animal origin, manure piles, garbage heaps, etc. It is their presence and activities in such material which induce the fermentation, decay, or putrefaction which takes place. They are present on dry hay and straw in considerable numbers, usually in the spore condition. They are present on the hands, face, head, and surface of the human body generally, and in immense numbers on the bodies of all animals, flies, and other insects. Any food material, whether cooked or uncooked, which is exposed, gets contaminated with them. As a result of this contamination the food is apt to spoil unless it is used before it has time to decay. Milk becomes sour or putrid as a result of the development and multiplication of the bacteria which get into it during the milking operations and subsequent handling. It may be said, therefore, that bacteria are practically present everywhere.

Just as there are many kinds or species of higher plants and animals, so there are many species of bacteria. Fortunately, the great majority of the species are beneficial in their action: some, however, are injurious, amongst which are those species which produce infectious diseases of men and animals, such as tuberculosis, typhoid fever, anthrax, etc., and those which produce diseases of plants. A different species of bacteria is necessary to produce each of these diseases.

In addition to those bacteria which are injurious, as causing disease, there are some which are beneficial in one place but injurious in another. For instance, many of the species of bacteria beneficial in the soil are injurious when they get on to food material, as they bring about the decay or putrefaction of the food, rendering it unfit for use if they are allowed to develop and multiply on or in it.



MAURITIUS: REPORT ON THE DEPARTMENT OF AGRICULTURE, 1917.

The sugar industry of Mauritius is very much the chief industry of the colony. In the report under review it is stated that the weather experienced during the year was not all that could be desired, the result being that though the cane crop was satisfactory in some districts, it was distinctly below the average in others. The total production of sugar for the Colony for the crop of 1917 was estimated at approximately 225,000 tons. The quality of the canes handled during the crop was, on the whole, satisfactory. According to returns taken from the Control Mutuel Sheets, the average composition of the cane handled in thirty-one factories was: sucrose, 13·40 per cent.; fibre, 12·31 per cent.

Considerable interest has been shown in the varieties of cane owing to a somewhat widespread anxiety that many of the standard varieties at present cultivated are beginning to show signs of deterioration. This, however, may be attributable to the spread of root disease, as the result of too intensive and, in some cases, defective methods of cultivation. Investigation showed that the disease was present in every district of the island, and it appears to have gained ground considerably in recent years.

There are two insect pests which cause a considerable loss of cane to planters in Mauritius. One of these is the grub of the well-known West Indian pest, the brown hard back (*Phytalus smithi*). Besides the collection and destruction of these insects, which accounted for 73,503,579 beetles in the year, great hopes are entertained that the parasitic enemy of Phytalus (*Tiphia parallelà*), which has been successfully introduced from Barbados, may be productive of highly important results. Another beetle grub which causes considerable damage in the cane area is (*Oryctes tarandus*). This is also parasitized by a wasp (*Scolia oryctophaga*), the introduction of which from Madagascar it is hoped will be successful, and prove a palliative for the depredations of Oryctes.

Owing to the increased cost of production of sugar, together with the difficulty in obtaining sufficient labour, the advice is given to planters that it will be wise for them to direct their attention to the possibility of economizing labour by the introduction of mechanical labour-saving implements.

Chemical control in factories is the rule in the majority of cases in Mauritius, and naturally yields good results. As in other cane-growing countries the complaint in Mauritins is the difficulty experienced in obtaining supplies of artificial manure for canes, and the greatly enhanced prices paid for them. The Director of Agriculture, Dr. Tempany, points out that though planters seem to hold that supplies of artificial manure, especially sulpbate of ammonia, are essential to the development of the crop, it is to be borne in mind that with an increase in price for the material in question of between two and three times its normal value a point may occur when the cost of the manurial application exceeds the value of the resultant increase in yield.

A considerable extension of the irrigation scheme in the Black River District of the colony took place in 1917. At the end of the year there were some 1,400, acres of land not previously worked, under cane cultivation. The mean yield per acre in the irrigated area was estimated at 22 tons of cane, giving a total yield of cane in round figures of 50,000 tons. It is hoped that in about two years more the irrigation plant will provide water sufficient for an area of 4,000 to 5,000 acres.

Turning to lesser industries, it seems that although high prices were obtained for Mauritius fibre during the year, the output was greatly restricted owing to the dfficulties of shipment. The cultivation of tea, although on a small scale, is in a fairly satisfactory condition, the tea produce finding a ready market for local consumption. Young coco-nut plantations have continued to make progress, and it is believed that in suitable situations the cultivation of coco-nuts has a reasonable prospect of success. Among new industries it would seem that successful experiments have been conducted by the Agricultural Department in the cultivation of tobacco, which indicate that it is quite possible to produce locally the type of tobacco largely imported at present from Réunion. The Governor of Mauritius, Sir H. Hesketh Bell, K.C.M.G., has directed the attention of the Board of Agriculture to possibilities of development in lime cultivation, seeing that in suitable situations lime trees already flourish in Mauritius.

As in other parts of the world, the necessity for increased production of food crops locally has attracted considerable attention in Mauritius. It appears from the statistical division of the report that the actual total production of foodstuffs in Mauritius only produces sufficient food to last the colony for thirty-six days, that is to say, that approximately nine-tenths of the food consumed is imported from abroad. As a result of the efforts made by the Government, the Department of Agriculture, and the Forest Department, a very appreciable increase, representing 66·7 per cent. on the area previously cultivated in food crops is recorded at the end of the year. In connexion with this matter, the erection of a Government maize-drying plant has been of considerable benefit to the people of the colony.

It is noted that the construction of dipping tanks for cattle on estates, and the regular use of them is being widely extended, and the report considers that it might be advisable to enforce compulsory dipping of stock throughout the colony by legislation, as it is stated is to be the case in South Africa.

Enquiries have been conducted during the year into the question of the production of motor fuel from alcohol. A report on the point by the Chemist gives as the result, that the patent petrol substitute known as 'natalite' could be satisfactorily manufactured and denatured for sale locally by the addition of certain quantities of pyridine and petrol.

This interesting report shows that much excellent work in many directions is being carried out by the officers of the Department of Agriculture in Mauritius. It may be noted that two of them, Dr. Tempany the Director, and Mr. Auchinleck the Assistant Director, were for some years in the West Indies as agricultural and scientific officers, the Antigua, and the second chiefly in Grenada.

Several new devices for washing canes before entering the mill have been installed in Louisiana with uniform good results. The washed cane works better in the mill than the unwashed, and the large quantity of mud which is washed off relieves the filter presses considerably. (The *Louisiana Planter*, December 28, 1918.)

MARKET REPORTS.

London.—The West India Committee Circular, January 23.

Balata—Venezuelan Block, 3/3 to 3/4; Sheet, 3/10.
Beeswax—No quotations.
Cacao—Trinidad, 90/-; Grenada, 85/-; Jamaica, no quotations.
Copra—£40.
Honey—West Indian, no quotations.
Lime Juice—Raw, 3/- to 3/6; concentrated, no quotations.
Pimento—No quotations.
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record January 21, 1919.

Bay Oil—Firm, at 18*s.* to 20*s.*
Lime Oil—Slow, at 5*s.* 6*d.* to 6*s.* for West Indian distilled, and 16*s.* to 17*s.* for hand-pressed.
Orange Oil—West Indian commands 8*s.* to 8*s.* 6*d.* per lb.

Barbados.—Messrs. T. S Garraway & Co., February 15.

Arrowroot—$10·00 per 100 lb.
Cacao—$17·50 per 100 lb.
Coco-nuts—$32·50 husked nuts.
Hay—No quotations.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—Dark Crystals, $5·50.

Trinidad.—Messrs Gordon, Grant & Co., February 8.

Cacao—Venezuelan, $20·50 to $21·00; Trinidad, $20·00 to $22·00.
Coco-nut Oil—$1·50 per gallon.
Coffee—Venezuelan, 20c. per lb..
Copra—No quotations.
Dhal—No quotations.
Onions—$3·00 to $3·50 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $3·50 per 100 lb.
Rice—Yellow, $13·00 to $14·00; White, 7·50 to $8·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros & Co., February 13.

Cacao—Caracas, 18¼c. to 18½c.; Grenada, 17½c. to 18c. Trinidad, 18½c. to 19c.; Jamaica, 16½c.
Coco-nuts—Jamaica selects, $50·00; Trinidad $51·00 culls, $26·00 to $28·00 per M.
Coffee—Jamaica, 17½c. to 19½c. per lb.
Ginger—17½c. to 20c. per lb.
Goat Skins—Jamaica 90c.; Antigua and Barbados, 85c.; St. Thomas and St. Kitts, 85c.
Grape Fruit—Jamaica, $3·00 to $3·50.
Limes—Nominal $6·00 to $6·50.
Mace—40c. to 45c. per lb.
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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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	PAGE.		PAGE.
Agriculture in Barbados	87	Items of Local Interest	86
Cacao Experiments in Trinidad	87	Market Reports	96
Citrus Trees, Pruning	93	Notes and Comments	88
Cotton:—		Onion Growing in Dominica	91
Community Cotton Production	86	Plant Diseases:—	
Sea Island Cotton Market	86	Observations on Eelworm (Ufra) Disease of Rice	94
Cotton in Nevis, Close Season for	88	Sarawak Bean (*Dolichos Hosei*)	88
Cuban Export Committee for Sugar	89	School Gardens	83
Departmental Reports	85	Soil Aeration	95
Gleanngs	92	Sugar:—	
Glycerine from Sugar	89	Industrial Alcohol from Molasses	84
Government Cotton Ginnery at St. Vincent	88	Sugar Industry in Guadeloupe	84
Hevea Seeds, Proper Packing of	93	Velvet Beans as a Stock Food	94
Huton, Mrs. J. A., Death of	89	West Indian Products	95
Insect Notes:—		Work of the Future, The	81
Some Insect Pests of Tropical Crops	90	Yeast. New Danish Invention for Making	89
		Zoological Research Station in the Tropics	89

The Work of the Future.

III.

THE production of cacao constitutes another important West Indian industry which is worth considering in the outlook towards the future. Cacao growing is sure to prove attractive to several of the newly developing tropical countries which are likely to come into prominence as the outcome of readjustment after the war. Already the phenomenal growth of production on the Gold Coast causes western growers to look anxiously to the future, and their only source of comfort lies in the inefficiency of their competitors. This inefficiency may diminish; the competition may become increasingly acute. Safety for West Indian producers seems to lie in increasing efficiency. As matters now stand, it may be conceded that the cacao growers of Grenada are highly efficient in respect to the quantity of cacao which they can produce per acre; efficient, that is, in comparison with some other cacao-producing countries. But even here there are weak spots which it is recognized require remedy, and even here there are features of the industry which have received comparatively little consideration.

It is a striking feature of this industry, as will be said later of the cotton industry, that the producers of the raw material are singularly ignorant of the requirements of the users of that material. This is probably more the fault of the users than of the growers, for a secrecy has been observed in regard to the manipulation of cocoa and chocolate which tends to retard the desired exchange of information between manufacturer and grower. Doubtless much better results could be obtained in the preparation of raw cacao, if the needs of the manufacturers were more accurately known. As matters now stand, the preparation is largely a matter of tradition based on rule of thumb. There is room for much investigation and research here, and work in this direction would undoubtedly be to the interest of the West Indian producer as well as that of the British user. Research work will assuredly soon be carried out to the benefit of those concerned with the industry. It remains to be seen whether the work will be done under British auspices, and whether the resultant benefits will accrue to British citizens.

Similar reflections might be made concerning other West Indian industries, such as those connected with

the production of limes and lime products, and the production of bananas, the great staple of Jamaica; and reference might be made to neglected opportunities in connexion with animal industries, in the production of cattle, of horses and mules, and in the production of pigs, with the consequent industries involved in the production of bacon and the great variety of pork products, but it must suffice to refer in detail to only one more product.

The introduction of the cultivation of Sea Island cotton has added a new industry to the West Indies, resulting in an output having an annual value during the past five years of some £183,000. It is true that the value of this commodity has been inflated by the war disturbances of the past few years, but not in a greater degree than that of sugar. It is significant too that the introduction of this industry has brought relief to several small West Indian communities, which had been the despair of those responsible for their welfare, and whose inhabitants were in danger of sinking into comparative indigence.

This industry illustrates in an unequivocal manner the assistance and stability which may be given to industries by scientific aid and investigations.

At every stage the cultivation of Sea Island cotton in these islands must be carried out on a basis of scientific knowledge. It is true that the individuals immediately dealing with the crops may possess no outstanding scientific attainments, but they must be constantly in touch with those who possess the requisite scientific knowledge, and they must be ready to be guided by their advice, or failure results.

The maintenance of the purity of the type of the cotton grown necessitates constant vigilance and the aid of expert workers, whose business it is constantly to supply pure lots of seed true to type, so as to maintain the standard, which otherwise is sure to deteriorate.

The control of pests and diseases has required the exercise of scientific research of no mean order, so as to provide data on which to base information for their control, and this in turn has necessitated the intervention of the Government, so as to ensure that by the entire community necessary steps are taken which scientific knowledge and practical experience together have shown to be essential for the safety of the industry.

The cotton industry illustrates in a striking manner the difficulties which may arise from a want of complete understanding between the several partners to an industry each of the other's requirements. During the early efforts to establish the best type of Sea Island cotton in these islands great difficulty was experienced in getting the growers to understand just what were the requirements of the spinners. Something was done to minimize this difficulty by experienced spinners visiting these islands and explaining their needs on the spot; but even then the difficulties were not entirely got over, for the spinners themselves were unable to explain their own needs clearly and on a scientific basis; they employed terms which connoted useful features in the cotton as exhibited in its behaviour in spinning, but these terms were vague and inexact. For instance, great stress was laid upon strength, but when steps were taken in various places to ascertain the actual breaking strain of cotton fibres, it was found that the spinner's idea of strength had little relation to actual breaking strain: indeed, in the case of certain Egyptain cottons the anomaly was found that the weakest fibres produced the strongest yarn. So the spinner was obliged to admit that, when he spoke of strong cotton, all he meant was cotton which would spin the strongest yarn, and he was obliged to admit also that he was ignorant as to the individual factors which conferred this quality. Other similar anomalies were found to occur in connexion with other trade requirements, such as fineness and other matters. Fortunately, the need for research in many directions, both in regard to agriculture, coupled with the guarantee of seed quality, and the control of pests and diseases, as well as in connexion with the obscure characters of the lint produced, has been recognized by the Government as well as by the planters, so that at present there exists in the West Indies a modest basis of scientific research in regard to these matters in their various aspects; and the indications are that this work will be extended and utilized, thus adding greatly to the chance of maintaining an industry which is sure to feel the effects of competition, and which, unaided, would assuredly come to grief within a very few years.

In addition to Government assistance in the way of research and investigation in regard to matters cognate to agriculture and its allied industries, it is thought by many that direct help should be given by way of protection. Doubtless this idea is sound in so far as it is sought to afford protection from unfair competition. Many a serious lesson has been learned in this connexion from the progress of events during the war, and there has been a revelation as to the extent to which unscrupulous nations may carry on industrial war. It seems inevitable, therefore, that protection necessary

in this direction will be afforded by all governments, but it is still a matter for debate as to the extent to which protection may be afforded beyond this. It will be wiser to rely upon industrial efficiency than upon fiscal protection, once protection is afforded against unfair and unjust modes of trading.

There is no doubt that as the present world tangle straightens out there will arise keener and keener competition in most industries, until possibly a state of commercial equilibrium is reached which may resemble the condition looked for by certain economists of a bygone school, when each country will produce those commodities for which it and its people have the greatest natural aptitude, and exchange them for other commodities produced by other people in like case. But to arrive at this condition, a period of competition and stress must be passed through.

There is one feature of this struggle which causes it to differ in a conspicuous manner from the physical struggle of which there has been such awful experience; it is this, that there is no long concealing of knowledge from competitors, nor can there be. Information concerning changes and developments in industries and in the scientific discoveries which influence them is passed from hand to hand with increasing swiftness: there is now no monopoly of knowledge, therefore, those who lack knowledge, or neglect to secure it, will be at so great a disadvantage in the struggle that they cannot long survive. The penalties for ignorance and error will be swifter and harder than they have ever been, and knowledge of mistakes will pass to competitors with painful rapidity. The world has shrunk in size, owing to the development of rapid means of communication, both as regards communication of ideas and of material things—cables, wireless telegraphy, telephones, steamships, airplanes, all add to the intensity of competition and to the reward of efficiency.

There is nothing in this industrial war to prevent those who have industrial and scientific knowledge and skill from going over to the ranks of competitors; this makes it necessary to realize that those who are associated in the working and sustaining of any industry must be linked together by bonds of common interest, an idea which lies at the root of all industrial co-operation. All concerned in an enterprise must feel that they benefit directly by its success. If they do not, there is none of that moral odium attaching to military spying to prevent them from going over to the ranks of competitors. This is a fundamental truth which should not be disguised; its recognition must influence the relationship between all concerned in any industry—capitalists, scientific advisers, and industrial workers. There must be common interests and the working together for a common good.

All this implies that there must be a wider recognition of common interests and common aims; it implies the conscious taking of thought for the preservation of industries to any particular country or colony; it will be insufficient to leave these matters, as in the past, to individual enterprise and open competition; the industries of a country must be organized and studied, so that every natural, or obtainable, advantage may be availed of to ensure the stability of the enterprise and the welfare and comfort of all engaged in it.

SCHOOL GARDENS.

The question of the educational value of school gardens has been consistently advocated by the Imperial Department of Agriculture. Several publications have been issued with the object of giving assistance to teachers in this direction. Three of these publications may be mentioned as of special value: (1) *Nature Teaching*, by Sir Francis Watts; (2) *Hints for School Gardens*, by Mr. A. H. Kirby, and (3) *Exercises for Indoor Gardening*, also by Sir Francis Watts. The second of these is out of print, but a new edition is being prepared which will shortly be issued.

Nature study is a subject of high educational value, and although it is doubtless true that agriculture cannot be completely taught in primary schools, only good can result in an agricultural country from leading the elder children to acquaintance with some of the principles that underlie the art of agriculture. Hence in primary schools the subject of nature study is best taught through school gardens. The chief object of such gardens is to interest the pupils to make observations at first hand on nature to learn to keep their eyes open, and to take note of changes in earth and air and in all life that depends on them for sustenance. An article by Mr. C. Drieberg, Superintendent of school gardens in Ceylon, which appeared in the *Tropical Agriculturist*, September 1918, puts the main object of school gardens in a very concise form which we reproduce below.

The main objects of school gardening may be thus summarized: (1) to train the children to habits of observation and to serve as a basis for nature study; (2) to brighten the surroundings of the school; (3) to relieve the routine of indoor work with outdoor work of a pleasant and recreative nature; (4) to instil order, neatness and good taste; (5) to cultivate a love of gardening; (6) to teach the dignity of labour, and to encourage an honest pride in the outcome of the work of one's hands.

Indirectly the school garden also serves: (1) as a training ground where children learn the cultivation of plants, and lay the foundation of practical agriculture; (2) as a means of disseminating useful seeds and plants; and (3) as an agency for the spread of information regarding new crops, and how to deal with them

There are difficulties in establishing school gardens such as securing suitable land and a satisfactory water supply. The objection of parents to their children doing manual labour is also sometimes a serious obstacle. But by co-operation between agricultural and educational departments such difficulties and obstacles can be made to disappear

SUGAR INDUSTRY.

SUGAR INDUSTRY IN GUADELOUPE.

In May 1918 the Syndicat des Fabricants de Sucre of Guadeloupe inaugurated an agricultural experiment station, to the directorship of which Mr. J. Sydney Dash, formerly Assistant Superintendent of Agriculture, Barbados, was appointed. From an article contributed by him to the *Louisiana Planter*, February 22, 1919, we take the following general account of the status of the industry in that island.

'Although coffee, cacao, and vanilla form industries of some importance, especially the first named, yet sugar heads the list, and is actually the only industry possessing any sort of organization. In early times it was carried on, as in most of the other islands, by means of windmills. The old walls of a few of these are still in existence. It is now, however, upwards of fifty years since sugar factories were erected, these being some of the very oldest in existence to-day. Geerligs in his book, The World's Cane-Sugar Industry, Past and Present, writes: "It was in these islands that sugar manufacture was first carried on in a rational scientific way, and the methods invented there have gradually been copied by most of the other sugar-producing countries." With the advent of factories and the low price of sugar, the tendency was for these to absorb the old windmill estates, until now practically all the sugar lands are in the hands of joint stock companies operated largely by European capital. The sugar crop last year amounted to about 30,300 tons, all in white crystals, the bulk of which went to France. Its value was approximately 22,500,000 francs.

'In considering sugar one must not forget the output of rum, which is very considerable. Practically all the molasses is converted into rum, which in 1918 was worth about two and a half francs per litre. The quantity made in 1919 was nearly 10,000,000 litres. The value of rum having increased very considerably, due to the war, the tendency was to produce large quantities at the expense of sugar. This has now been stopped, and it is likely that this year more attention will be paid to sugar. There will still be a large quantity of rum made, as scattered about the island are a large number of distilleries operated by small planters. These take off the cane of small growers out of reach of the factories, and the cane reaped during the months the factories are not at work.

'From a table appearing in Geerligs' book, previously quoted, it is stated that in 1884 Guadeloupe exported 55,257 metric tons of sugar. I am not in a position at this time to give the exact acreage in cane, but from personal observation it seems certain that if improved cultural methods are adopted, and the factories modernized in every way, including of course, proper chemical control, the island could be made to yield at least 60,000 tons— that is, about double the present output. Moreover, there are lands which now support a growth of rough wood employed by the factories for fuel, areas which would also be available for sugar growing if the factories were so modernized as not to require such large quantities of wood as they now consume. The soils are, for the most part, fertile, and it is astonishing in some places to see what good crops of plant cane can be grown in spite of the none too thorough methods of cultivation

'As in most sugar-growing countries, ratooning is practised to a very great extent. In Guadeloupe, owing in a measure, to the scarcity of labour, there has been a tendency to over-ratooning. This holds true particularly in the drier districts, where it is not unusual to find second and even third ratoons. The yields from the last two are often negligible, and must involve a pecuniary loss when the cost of fertilizers and reaping expenses are taken into consideration. In the wetter districts there is often a temptation to ratoon even more. When the fields cease to give remunerative crops they are frequently abandoned or thrown out of cultivation for a couple of years or more, depending on the labour available, before being again ploughed and replanted.

'Recently tractors have been introduced with some success, except that the subsoil is not being broken, and the ploughing done is at the same depth or very little more than with the ordinary animal drawn plough. For greater yields subsoiling is absolutely essential as the surface soil has been subjected to heavy cropping for a number of years. The Station Agronomique has introduced subsoil ploughs, and already planters are beginning to employ them in preparing their fields.'

INDUSTRIAL ALCOHOL FROM MOLASSES.

It is evident that the utilization of molasses in the production of industrial alcohol is one of the pressing questions for large sugar factories. A paper on the subject by J. P. Foster of the Hawaiian Chemist Association, October 28, 1919, is reproduced in the *International Sugar Journal*, February 19, 1919. Considering the importance of the subject we quote this below:—

The operation of a distillery for the production of industrial alcohol presents few if any difficulties. The manipulation of a still where high-grade cologne spirits is not desired is much more simple than the operation of a vacuum pan or of a modern multiple effect.

Such problems as are presented lie almost exclusively in the process of fermentation, and there, it is true, they are many and varied, but by no means impossible of solution. A distillery operated on a sugar plantation in conjunction with the factory, will have to contend with an almost inconceivable bacterial activity.

Air and water, as well as the molasses, are contaminated with yeasts, moulds, and fungi from diseased cane in the fields, from the fermenting mud-press cake, and from innumerable centres of infection in the factory. This condition can only be met by the most careful antiseptic methods. There must, of course, be pure yeast culture, and, on account of our climatic conditions, the yeast must be suitable to high temperatures. The yeast must also ferment very rapidly, so as to attain a satisfactory attenuation of the mash before the wild yeasts can get hold; and the difficulty is to obtain this rapidity of fermentation without a temperature which will render the pure culture anæmic and unfit for further fermentation. It is not possible to do so without cooling coils in the fermenting tubs, so that the temperature may be kept down to a maximum of 95° F, but 85° preferably. The correct procedure in the fermenting house is to have a suitable cooling system, to sterilize the molasses, use only condensation water from the effects for making the dilution of the molasses, to set up the fermentation with pure culture yeasts, and not to fill the tubs much, if any, more than half full. This latter is an important condition, for if it is observed, the heavy layer of foam on the surface of the fermenting body will be undisturbed by air currents, and there will also be a thick layer of carbon dioxide over the foam. As a result, wild yeasts will be to a great extent prevented from gaining access to the tubs

These precautions, with a liberal use of a scrubbing brush and 'elbow grease', will ensure satisfactory results in the fermenting house.

After the fermented material, or 'beer', has been pumped over to the still house, the procedure is simple in the extreme. Fortunately the amount of labour required is small, so that it is not difficult to obtain men who are suitable to be 'broken in' for the work, for in starting a distillery there is no class from which to draw trained men. One good pure culture man, two fermenting house men, and two still men, five in all, are all the skilled labour required, so that the labour question is not at all serious in a distillery. If the production of rectified spirits is required, then the problem would become more difficult.

All the problems to be overcome in an industrial distillery may be summed up in two words, 'temperature control'. If this is satisfactory, all the other difficulties will solve themselves.

NYASALAND PROTECTORATE: REPORT ON THE DEPARTMENT OF AGRICULTURE FOR THE YEAR ENDED MARCH 31, 1918.

This report, which has recently been received, is a record of good work done in the face of difficulties. It must be remembered that during the year under review Nyasaland was concerned in providing food to a large extent for the forces operating against German East Africa. The agricultural department made great effort to develop local resources to their utmost, and an arrangement was made with European planters to place under maize for military use an area equal to 25 per cent of their cultivation The resulting crop of 3,000 tons approximately was contracted for at the rate of £5 per ton, and was used instead of imported rice from India. In addition to this production by Europeans, arrangements were also made to induce the natives to produce 56 lb. of maize per hut, and a further 3,000 tons approximately was obtained in this manner. The production of 6,000 tons of grain locally, at a cost of £30,000 to £40,000 as against £150 000, which a similar quantity of imported food would have cost, is rightly regarded by the Director of Agriculture as an important fact, showing that the protectorate can be more self-supporting in the matter of foodstuffs.

By controlling the cattle industry also, and paying the natives a fair price for their animals, a reasonable supply of fresh meat was rendered available to the troops in the field, at an average of 6*d*. per lb. as against the cost of 1*s*. 6*d*. per lb. for imported bully beef.

The two most important crops of the protectorate are tobacco and cotton. With regard to the first of these, the crop for the year under review was one of the best, and certainly the most profitable tobacco crop yet produced in the protectorate. Tobacco is now the principal agricultural industry of the highlands, and Nyasaland growths of tobacco have been introduced to the trade in England, the increasing competition for the crop being the best indication of its suitability for home trade requirements. Nyasaland tobacco may be said now to have established an assured position in the tobacco market of Great Britain.

It is being more and more realized that food crops, such as maize and beans, are beneficially grown in rotation with tobacco, rather than relying on outside sources for all food for estate labourers.

With regard to the cotton crop of the protectorate, the report states that for the last few years the yield per acre in the Blantyre and Zomba district has been decreasing, largely due to growing cotton continuously without manure, on an extensive rather than an intensive system of cultivation, in areas where climatic conditions are unfavourable. Blantyre is too cold and exposed for successful cotton growing, and is essentially a tobacco-growing district, but there are many thousand acres bordering Lake Nyasa which are most suitable for cotton growing. Nyasaland cotton has, however, maintained a standard of high quality, and in experiments carried out by the Agricultural Department, it has proved itself to be best adapted for local conditions, especially when grown from selected seed. Further trials of some of the best types of the longer staple Uganda cotton are being continued. The total production of cotton by Europeans in 1917 was 4,448 bales of 400lb each, valued at £74,133.

The native crop of cotton shows a total of 1,070 tons, a considerable increase over that of the previous year. The Director of Agriculture considers that the native cotton industry is now well established in certain districts as long as the industry is fostered and supervised by the Department. The cotton grown by the natives commands equal prices to cotton grown on European estates. With regard to future development, a report on the subject has been forwarded to the Empire Cotton Growing Committee.

Another promising industry in Nyasaland is tea growing, under which there are 4,523 acres. The tea planters in Nyasaland, however, laboured under great disadvantages during the season under report, owing to the restriction placed on the importation of tea into Great Britain. Tea is a crop demanding the investment of considerable capital, with little hope of return for the first five years. It can only be abandoned with loss of capital; and in this respect is unlike annual crops, such as cotton and tobacco, where profit or loss accrue in the same year as the crop is planted. It is hoped that the future of this industry will be brighter, now that the war is over.

Among the experiments conducted on the government farms, it is noted that planting cotton and maize on alternate ridges, to ascertain whether early shelter followed by subsequent increase in room, light, and air would so benefit the cotton that the net results would be better than by growing both crops apart, gave the result of a benefit of about 6*s*. 8*d*. per acre in favour of mixed as against pure cultivation in the case of these two crops.

The experience in Nyasaland bears out the recommendations of the Imperial Department of Agriculture to cotton growers in several points. In first place, the report states that there is little doubt that improvement will be more quickly obtained by concentration on breeding and selecting from established strains; and secondly the vital importance of uprooting and burning all cotton bushes to avoid the attack of the principal cotton pests is also noted.

With regard to live stock, a warning is recorded as to the risk of sheep raising in Nyasaland, if European breeds are used. The combination of heat, heavy rainfall, long grass, and endemic parasites of various kinds acts adversely upon sheep of woolbearing breeds.

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended February 22, 1919, is as follows:—

ISLANDS. There has been an active demand throughout the week for Fine to Fully Fine, resulting in sales of upwards of 1,000 bales, although the Cotton Exchange reports only 225 bales, the buying being on account of the Northern Mills based on our quotations. The supply of this quality is now reduced to 500 to 600 bales, for which there is a good deal of inquiry, and this limited amount remaining in the crop may at any moment be disposed of. The quality is better in grade, staple, and fineness, than any selection we can make out of the Georgia and Florida crops.

Of the unsold stock remaining on hand much the larger proportion consists of cotton more or less off in preparation.

We quote, viz:—

Fine to Fully Fine, 53½c. to 54c., f.o.b. and freight.
Fine to Fully Fine, slightly off in preparation, 52c. to 52½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. There was a quieter feeling in the market this week, and some orders were filled at some slight concession in price. The market, however, is about steady at our quotations, with a moderate demand.

We quote, viz.:—

Extra Choice, 52½c., f.o.b. and freight.
Average Extra Choice, 51c. to 51½c., f.o.b. and freight,

The exports from Savannah for the week have been: to Northern Mills 812 bales, and from Jacksonville to Northern Mills 800 bales.

COMMUNITY COTTON PRODUCTION.

The following remarks from the report of the acting chief of the bureau of plant industry of the United States Department of Agriculture for the year ended June 30, 1918, corroborate the advice which has been consistently given to West Indian cotton growers by the Imperial Department of Agriculture:—

That all cotton production should be placed on an organized community basis appears the more desirable with each additional season of experience in such efforts. The most direct and obvious advantage of uniting upon a single variety is that each farmer in the community can get more for his cotton than if many kinds are raised. There is no question that large buyers and manufacturers will pay more for cotton of one kind than can be had by the hundreds of thousands of bales than for cotton that can be had only in small lots, with each farmer feeling at liberty to grow a kind different from his neighbours.

The result of mixing the seed of many varieties at public gins, and of planting such 'gin-run' mixtures of seed is a general and continuous degeneration of varieties. This can be counteracted only in a partial and temporary way by the breeding and distribution of seed of select stocks, which soon lose their purity and uniformity when grown in mixed communities.

The chronic deficiency of pure seed, even of the oldest and best known varieties, is traceable largely to the lack of communities where seed of one variety can be grown without contamination. The advantages of community production of one kind of cotton and adequate supplies of pure seed have been demonstrated conclusively in the Salt River valley of Arizona, which now has the largest body of uniformly pure cotton in the world. The first communities that were organized in different parts of the cotton belt are being utilized in the same way as sources of supply of pure seed for other communities that are beginning to organize.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Plant distribution during the month of January comprised the following: coco-nuts, 49; ornamental plants, 55; other economic plants, 4; 17 packets of seeds, and 1 bundle of cuttings. The local price of cacao, Mr. Moore states, had risen to 17c. per lb., while the local price of corn on cob was 12*s.* per barrel. The reaping of the sugar crop was in progress. The area under Sea Island cotton is estimated at 40 to 50 acres. The crop is being harvested, and the prospects are reported to be fair. The cotton ginnery was timed to be opened on February 10, and the crop is to be handled on a co-operative system similar to that obtaining in St. Vincent. The rainfall recorded at Richmond Hill for the month was 2·81 inches.

ST. VINCENT. Mr. Sands writes to say that good pickings of white cotton continued to be obtained during the month of February. On the twelfth 400 bales of Sea Island cotton were shipped to the War Office. Reports on the Marie Galante cotton at Union Island are not satisfactory. It is feared that cotton stainers, which now abound there, are responsible. An investigation will be made. The digging of arrowroot was on some estates retarded by the unwillingness of labourers to undertake the task, although the prices paid were much higher than hitherto. Syrup is being made by most estates growing sugar-cane. Exports of syrup have been made to Canada. The return from Montserrat of Mr. S. C. Harland, B. Sc., Assistant for Cotton Research, on February 4, is recorded. On February 12, a scheme for agricultural education in St. Vincent was discussed with the Administrator and Inspector of Schools by the Agricultural Superintendent. The weather during the month was seasonable, the rainfall recorded being, Botanic Station, 2·75 inches; Experiment Station, 2·07 inches.

ST. LUCIA. The following distribution of plants is recorded for the month of January: limes, 400; budded oranges, 42; cacao, 500; coffee (Robusta), 125; ornamental, 11; 3 packets vegetable and 1 packet tobacco seeds. Mr. Brooks states that the lime crop is practically over, and reaping operations were in full swing in connexion with the sugar crop. Work has been commenced in converting the Soufrière Market Square into a public garden. The rainfall registered at the Botanic Gardens, Castries, during the month was 1·95 inches; at the Agricultural and Botanic Station, Choiseul, 1·37 inches.

DOMINICA. The crop gathered in the lime experiment station during the month amounted to 25 barrels of fruit, making a total of 1,060 barrels for eleven months. The work of improving this station was continued during the month. Plant distribution included 200 packets vegetable and 6 lb. coffee seeds. The local price for green limes, Mr. Jones states, has risen from 6*s.* to 16*s.* per barrel, and that for ripe limes from 3*s.* 6*d.* to 5*s.* per barrel. Raw lime juice advanced from 7*d.* to 8*d.* per gallon. Cacao has been in demand

locally at 16c. per lb. The vacancies for agricultural pupils attracted seven candidates who presented themselves for examination on February 7. Three were selected for a two-years' course of instruction, and commenced their training on February 24. The weather was dry, the rainfall recorded for the month being 1·52 inches.

MONTSERRAT. According to notes forwarded by the Curator, Mr. Robson, drought prevailed during the greater part of February, but a few good showers fell at its close. Plant distribution included: bay plants, 1,550; grafted mangoes, 4; bread-and-cheese seeds, 2 lb. The area to be planted in cotton, Mr. Robson says, promises to be larger than in 1918. The crop produced in 1918 has reached a total of 417,563 lb. of lint, with a few bales yet to be delivered. This constitutes a record crop for the island. Defaulters under the Cotton Ordinance enforcing the destruction of old cotton plants have been dealt with in the Magistrate's Court. It would seem that, as a result, the uprooting of old plants has been much more effectively done than in last season. Cotton seed, chiefly of the strain H.23, has been distributed to estates for the purpose of planting seed fields. Interest in planting bay trees remains keen, but the work is being considerably hampered by the small number of flower pots on hand in which to raise the plants. Provision crops have been plentiful during the month. The destruction of silk-cotton trees in the island has been proceeded with, and planters in most districts are co-operating with the Government in the supervision of the work: several hundred trees have been felled. The Assistant Curator has been employed chiefly in supervising this work on the lands of small holders. The rainfall recorded at Grove Station during the month was 2·14 inches; the total rainfall for the year to date is 6·45 inches.

ANTIGUA. During the month of February 5,332 sugar-cane plants and 1,600 onion plants were distributed. The reaping of the cane crop, Mr. Jackson states, was commenced about the middle of the month. On the whole, the young crop looks well. The returns of the island this year it is estimated will be about 25 per cent. better than those of last year. The area under cotton is about 872 acres. Last year 510 acres were planted in this crop. Cotton stainers are common in the fields, and the flower-bud maggot is still prevalent. An Ordinance providing for the destruction of silk-cotton and John Bull trees was passed during the month. The cotton lint purchased for the Government to date amounted to 44,136 lb. while the total amount of seed-cotton purchased for the British Cotton Growing Association is 39,942 lb. The rainfall during the month was 6·77 inches.

ST. KITTS. Mr. Shepherd writes to say that the Basseterre factory commenced reaping operations early in the month of February, and so far, progress has been satisfactory both at the factory and on the estates. Owing to the dry weather the canes are ripening fast, and the quality of the juice is improving. The young cane crop has felt the want of rain, and many supplies have been needed. A welcome precipitation of 1·50 inches at the end of the month will do much towards establishing the young plants The old cotton plants have been turned in, and preparation is being made for the new crop. In the northern district, where the close season is from December 15 to January 31, planting has begun in some places. The demand for good seed for planting purposes is very great. The campaign against the native food-plants of the cotton stainer is being carried on, and it is hoped that by the end of March the trees will have been destroyed. The rainfall recorded for the month is 2·19 inches.

AGRICULTURE IN BARBADOS.

February closed with a very moderate rainfall, in spite of the showery days which occurred between the 13th and 23rd of the month. Very few districts, even in the hilly parts of the island, registered more than 2 inches for February, while in the lowlying parishes the average for the month is not much in excess of 1½ inches,

With few exceptions, the crops are being steadily reaped. The weather which has prevailed during the past three months is ripening up the fields rapidly.

While there is no complaint about the yield in general, it is stated that the crop will not be as large as was anticipated some time ago. The sea-board is giving a moderate yield only, while on few estates is there anything like a very high average tonnage. We hear of fields yielding 40 to 42 tons cane per acre, but in the black soil, where only plant canes are being reaped, the average is about 32 tons. In ratooning districts the average is about 28 tons, and it is not expected that this figure will be maintained.

The fuel question is not as easy as at this date last year. The canes are more juicy, and, except where there is a triple effect, there is generally a shortage. There will doubtless be an improvement as the canes grow more mature, but, at the present time, extra fuel is required by many estates.

The canes of peasants are being purchased on a better basis this year than in past years. This should stimulate industry among peasants, and act as a strong incentive to them to till and manure their land with care.

The showers which fell during the latter part of February have materially helped the young crop, and the supplies are coming up fairly regularly. Rain is, however, again needed in order that a general and rapid growth may be assured. (The Barbados *Agricultural Reporter*, March 8, 1919.)

CACAO EXPERIMENTS IN TRINIDAD.

In experimental work on cacao attention has hitherto been devoted mainly to trials with manures, not only in Trinidad, but in other cacao-growing countries also. From the report on the Department of Agriculture for the year ended December 31, 1917, it would seem, however, that experiment work being now proceeded with at the Government estate, River, is of a more varied character than probably anywhere else in the world. It has also the great advantage of being conducted on a fairly large scale, and under estate conditions.

In one of these experiments the task of recording the individual yield in pods of some 10,000 trees is included. The results show that, speaking generally, heavy bearers continued to be heavy bearers, and the poor bearers to be poor bearers. It would seem, therefore, that the capacity for producing heavy crops—other things being equal—is a characteristic of the individual plant, and therefore is likely to be hereditary. The results of cross-pollination and variation come into play with seedlings, but, by budding and grafting, individual characteristics should be transmitted unimpaired. For the purpose of testing this question thoroughly, a 6-acre plot at River has been planted with seedlings and with budded and grafted plants from the same thirty selected heavy bearers. The results will be looked forward to with great interest.

Budding from selected trees on to basal suckers of poor bearers has been successfully tried, and experiments are being carried out to test this under field conditions as a method of replacing poor by heavy bearers, and so increasing the yield per acre. Experiments with regard to the advisability of planting shade trees or not continue to give interesting results, but definite conclusions have not yet been drawn.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†Provided by the Imperial Department of Scientific and Industrial Research.

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial is the third and concluding portion of Work of the Future, and deals with some other crops than sugar-cane.

Under Insect Notes on page 90, some notes are printed concerning certain insect pests of tropical crops.

A nematode worm attacking rice is noticed under Plant Diseases on page 94.

On page 91 there will be found an account of [illegible] experiments in onion growing.

Close Season for Cotton in Nevis.

In the *Agricultural News*, December 14, 1918, attention was drawn to Ordinances in force with regard to cotton in various West Indian islands. A despatch from Major Burdon, Adminstrator of St. Kitts-Nevis, has been received by the Imperial Commissioner of Agriculture for the West Indies, to the effect that a close season for cotton, from March 1 to March 31, has been proclaimed for the island of Nevis.

The article referred to above, pointed out that in St. Kitts a close season of six weeks had already been proclaimed, the dates differing according to the districts into which the island has been divided for the purpose.

It cannot be too strongly emphasized that such a close period is necessary in every one of the cotton-growing islands of the West Indies, if the production of Sea Island cotton, and its preservation from insect pests is to be a success in the future.

Government Cotton Ginnery at St. Vincent.

From information recently forwarded by Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, it is evident that the Government Ginnery in that island is doing a large amount of good work.

In the first place, it purchases on a co-operative basis, as was noticed in the *Agricultural News*, Vol. XVII, No. 224, all the seed-cotton from small growers, some 2,280 in number; and besides this, it gins and bales about 85 per cent. of the entire cotton crop of the colony. In the next place, it expresses the oil from all the cotton seed obtained from the crop, a large amount of which used formerly to be shipped to Barbados. From the Ginnery also is distributed selected seed for planting purposes, amounting to 14,535 lb. in the season just closed.

Besides dealing in this way with the cotton crop a large proportion of the corn crop is now handled at the Ginnery, where also other products, such as peas and beans, are fumigated and stored.

It may be mentioned that another Blackstone Crude Oil Engine, a duplicate of the one in use, is being installed to relieve the steam engine and boiler, which have done good service.

Sarawak Bean (Dolichos Hosei).

With reference to this plant, a note on which was published in the previous issue of this Journal, Mr. A. J. Brooks, Agricultural Superintendent, St. Lucia, states that numerous applications have been received for seed, but that very few seeds have been found. He has been able to distribute plants by root division, establishing the portions in pots until a strong root system had been developed.

In a later communication Mr. Brooks states that he has found that the plant shows a tendency to produce seeds if supports are provided for it to climb on. As it is certainly a valuable plant as a cover dressing, this information is of interest. It should thus be possible to distribute seed for further trial in other islands.

Cuban Export Committee for Sugar.

A communication dated February 6, 1919, has been received by the Imperial Commissioner of Agriculture for the West Indies from the United States Sugar Equalization Board, Inc., that at the earnest request of the Cuban Government the Equalization Board has appointed a committee, to be known as the Cuban Export Committee, to act in behalf of the Equalization Board in the matter of shipment of raw sugar direct from Cuba to nations other than the United States and those represented by the Royal Commission of the United Kingdom on the Sugar Supplies.

This business will be purely local to Cuba, and will be conducted in close conjunction with the Cuban Government.

Exports by the Committee will be regulated from time to time by the United States Sugar Equalization Board, and will be dependent upon the national requirements of the United States, due regard being given to the necessities of other nations.

These arrangements are made in order that the Cuban Government may continue its trade relations with countries that have in the past carried on commercial intercourse with the Republic.

Glycerine from Sugar.

In the shortage of supplies of vegetable and other fats, under which Germany suffered during almost the whole period of the war, it was strongly suspected that German chemists had succeeded in producing glycerine, an essential in the manufacture of explosives, from other material. No definite information, says the *Perfumery and Essential Oil Record*, January 1919, has come to hand as to whether this suspicion was correct, but it is supported by recent investigations in America. As far back as September 1917, American chemists claimed to have discovered a process whereby glycerine could be produced from sugar at one-fourth the cost of manufacture from the usual sources. Doubts, however, were freely expressed as to this estimate of cost.

The success of the American chemists has now been established. The work was done in the laboratory of the Bureau of Internal Revenue and definite information has been published on the point by Mr. McAdoo, Secretary, United States Treasury. It is claimed that the process which was at once communicated to the governments of the allies, would have insured ample supplies of glycerine, had the demand for munitions continued even in a much accentuated degree.

It is stated that after three months of experimental work, the chemists of the internal revenue laboratories reported the discovery of a synthetic process by which glycerine could be produced, but the cost could not be gauged by small-scale experiments. The experiments were therefore extended to a large industrial plant, and by February 1918 the process had been tried on a scale sufficently large to prove its effectiveness, both in producing glycerine and as to the commercial potentialities of its production. The process is said to be a fermentative one.

Death of Mrs. J. A. Hutton,

In *The Field*, February 15, 1919, the death is recorded of Mrs. J. Arthur Hutton. Mr. Hutton was for many years the Chairman of the British Cotton Growing Association, and his efforts to promote the cotton industry in the West Indies are gratefully recognized. Mrs. Hutton accompanied her husband on a visit to these islands in 1901, and is remembered by many friends. We tender to Mr. Hutton our very sincere sympathy.

A Zoological Research Station in the Tropics.

The New York *Zoological Society Bulletin*, January 1919, states that the Tropical Research Station of the New York Zoological Society will be opened in the Bartica district, British Guiana, this month, and that work will be carried on throughout the year. Dr William Beebe, the Director of the Station, passed through Barbados recently with a corps of assistants and artists, and he will be followed during the spring and summer by a number of well-known scientists, who will take advantage of opportunities of carrying on various lines of research in the tropical forests. It may be mentioned that Prof. H. F. Osborn, the well-known President of the New York Zoological Society, accompanied Dr. Beebe on a short visit to British Guiana.

The permanent headquarters of the station, known as Katabo, is at the junction of the Mazaruni and Cuyuni rivers. Here bungalows and a large laboratory have already been built. Especial attention will be devoted this year to sending live animals to the New York Zoological Park, as well as to gathering material for a new volume of *Tropical Wild Life*, the first volume of which, by Dr. Beebe, was published last year.

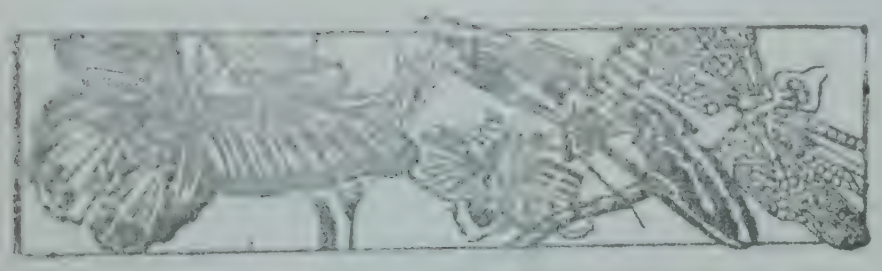
A review of this volume, to which the late President Roosevelt wrote an introduction, appears in the same number of the *Zoological Society Bulletin*.

New Danish Invention for Making Yeast.

The *Weekly Bulletin* of the Department of Trade and Commerce, Canada, January 13, 1919, has an interesting note on a new Danish invention for making yeast without the use of grain, and at the same time without producing alcohol.

This method is called after the inventor, Rosenkjaer, and is based on obtaining the largest possible quantity of yeast with as small a formation of alcohol as possible. Further, in the manufacturing of the yeast an effort is made to replace grain with other organic raw materials, such as molasses.

With the use of molasses as organic raw material, and with comparatively small amounts of inorganic salts, the result has been reached that from one hundred parts of molases, with a sugar consistency of about 50 per cent., there is obtained forty parts of bakery yeast, while there is formed only a trifling quantity of alcohol. The quality of the yeast is said to be very satisfactory for bakery use. It is of a light grey brown colour, and the raising power for bread is fully equal to the common alcohol yeast. There is no reason why grain and potatoes may not also be partly used as inorganic material.



INSECT NOTES.

SOME INSECT PESTS OF TROPICAL CROPS.

The following notes from the report of the Entomologist of the United States Department of Agriculture, for the year ended June 30, 1918, dealing with insect pests affecting tropical crops, are of interest and value:—

COTTON BOLL WEEVIL KILLED BY POISON.

One of the most striking achievements of the Bureau culminated during the year in the announcement of the value of powdered lead arsenate or calcium arsenate against the cotton boll weevil. After years of experimentation the Bureau is now able to announce that the weevil can be killed during the summer months by dusting the cotton with either of these poisons at the rate of 5lb. per acre, with three to five applications at weekly intervals. The poisoning, to be most effective, should be done between 4 p.m. and 9 a.m., and the powder should be applied by means of a rotary dust gun or by power machinery. A special power machine has been developed which will cover nearly 200 acres per day. The cost of treatment is about $1·00 per acre for application. Distinct gains in yield of from 250 to 1,000 lb. of seed-cotton have been obtained. It is hoped that the application of this discovery will greatly increase the yield per acre of cotton, one of the most important crops of the nation.

It may be mentioned that the cotton boll weevil (*Anthonomus grandis*), one of the worst cotton pests in the world, and which is responsible for an immense amount of damage to the cotton crop of the South-eastern States, has fortunately been kept out of the West Indies up to the present. It is important that the United States Department of Agriculture have been able to put forward a method of control. The success of the method referred to above seems to be due to the thirsty habits of the insect, which sucks up the dew from the surface of the plants, and thus, when the plants have been dusted with the poison mentioned above, the weevils imbibe their death potion.

SWEET POTATO WEEVIL ERADICATION.

Following an urgent request, an emergency fund of $30,000 was made available about March 1, for an investigation of the sweet potato weevil in the States of Florida, Georgia, Alabama, Mississippi, Louisiana, and Texas, which might lead to its eradication and control. This has made possible a preliminary farm to farm survey of all outlying infested territory, definitely establishing the boundaries of infestation. A series of large-scale experiments in control have been undertaken at field stations in Texas, Mississippi, and Florida, and demonstration eradication projects have been initiated in portions of Florida, Georgia, Mississippi, and Alabama, the close survey accomplished having established the feasibility of operations for that purpose.

An educational campaign by inspectors has already been productive of much benefit, and has reduced materially the number of infested farms in Georgia, Alabama, and Mississippi; indeed it seems probable that the completion of another season's work may find the sweet potato crop of the least infested of these States nearly weevil free.

Experiments with heat curing of sweet potatoes have shown the possibility of securing a mortality of 95 per cent. of weevils in storage houses by carrying the tubers at a temperature of 115° F., for eight days. In badly infested districts in Texas, where weevil injury is frequently 50 per cent., losses have been reduced to less than 10 per cent. by the timely application of arsenical sprays.

Life-history and investigations have brought forward many interesting facts regarding this weevil which can be applied in the coming season to excellent advantage. Good progress has been made in a survey of the wild food-plants of the pest. On the whole, the beginning of the fiscal year 1919 finds the Bureau well equipped to conduct a most effective campaign against this pest during the coming season.

INVESTIGATIONS OF INSECTS AFFECTING CITRUS FRUITS IN CALIFORNIA.

Work in control of the two important mealy-bug enemies of citrus trees has been continued during the year and has resulted in notable success. The means now recommended by the Department are being generally recognized as practicable and efficient methods of handling infested orchards. This is particularly true in reference to the so-called citrophilus mealy-bug. The study of this insect was begun during the year in response to a petition from citrus associations and fruit exchanges in western San Bernardino County, where considerable alarm had been aroused by the rapid spread and great damage done by this scale insect. The citrophilus mealy-bug is a comparatively new pest, which started with an invasion of a few trees in 1915, but now covers an area of about 1,000 acres. A 20-acre demonstration plot has been freed from this mealy-bug by the combined procedure of control of the Argentine ant, spraying the trunks of the trees, and utilization of predatory natural enemies.

The important relationship of the Argentine ant to infestation by mealy-bugs in southern California has necessitated as a first step the control of this ant. This is accomplished by the use of poisoned ant syrup. This method of control has already been extended on upwards of 200 acres in this district, and a great expansion of this work is now in progress.

CONTROL OF THE FLUTED SCALE IN NEW ORLEANS.

This project was completed during the year and was discontinued on June 30. It was an enterprise conducted by the city of New Orleans, the State of Louisiana, and this Department in co-operation. The control of the fluted scale has been accomplished in New Orleans and neighbouring places by the propagation and liberation of thousands of the natural enemy of this scale insect, the Australian lady-bird, *Novius cardinalis*. Over 300 colonies of these lady-birds were liberated over an area of 40 square miles. The distribution of this beneficial lady-bird has been extended to the known outlying infestations of the fluted-scale in Louisiana, Mississippi, and Texas. In connexion with this work, some very interesting studies have been made of the fluted scale, its lady bird enemy, and particularly the symbiotic relationship between the fluted scale and the Argentine ant. The results of this work demonstrated that this ant, by protecting the fluted scale from its natural enemies, increased the multiplication and destructive-

ness of this scale insect, and that therefore one of the effective means of controlling this scale is to control the ant, as has been demonstrated similarly in the case of the mealy-bug in California referred to above.

The Argentine ant (*Iridomyrmex humilis*), is not found in the West Indies, but a similar symbiosis exists between the acrobat ant (*Cremastoguster* sp.), common in these islands, and certain scale insects. Mr. Ballou the Entomologist on the staff of the Imperial Department, of Agriculture has recently noticed the association of this ant with the mealy-bug on cacao trees in Grenada.

ONION GROWING IN DOMINICA.

In the report on the Agricultural Department, Dominica, for the year ended March 31, 1918, there is an interesting section on onion growing, most of which is reproduced below. Mr. J. Jones, the Curator, states in that report that, as far back as 1900, experiments in growing onions were conducted at the Agricultural School, both with Teneriffe seeds and also with sets imported from Bermuda. These trials continued until 1905, good results being shown both in the field and in the results of the shipments of the produce to New York.

The experiments failed to attract the attention of planters or small growers, and nothing further was attempted in this direction, until about three years ago, when Mr. E. J. Seignoret, on acquiring the Spring Hill estate, undertook onion cultivation. During three seasons this planter has been uniformly successful in raising onions, and each year sees an extension of the area under this cultivation, the success of which is now attracting the attention of others. The crop of onions raised at Spring Hill during the 1917-18 season weighed 15,000 lb.

While it is desirable that the cultivation of onions should be taken up on a considerable scale in Dominica, both for the local demand and for export, it is advised that beginners should experiment with small areas, say, $\frac{1}{4}$ or $\frac{1}{2}$-acre lots, in order to gain experience before undertaking the planting of larger plots. Small cultivations, such as onions, are exacting in their requirements, and unless the necessary attention is given at the right time, failure will result.

Judging by the early experiments, and also by the recent cultivation carried on by Mr. Seignoret, who has had the advantage of an agricultural training, it is now known that certain parts of the leeward coast of Dominica are well suited for onion cultivation. During the past season when, owing to war conditions, the seeds which are imported by the Agricultural Department did not arrive from Teneriffe until early in November, or two months late, the onions did remarkably well, while in the Northern Islands, owing to the late arrival of the seed, the crop partly failed.

The work which has been carried on shows that good onions can be produced in Dominica from Teneriffe seed, under certain conditions. The onions have been found, on the whole, to store well. Further, a proportion of these onions, after being stored for several months, have, on being planted, produced seed—a rare event in the West Indies. This matter of the production of fertile onion seed is very important, and one which needs further careful experiment.

The production of sets from Autumn sowings of seeds is also receiving attention, with a view of their being stored for a time, and then planted with the rains during successive months. If such a course is found practicable—it has already given a measure of success—onions could be produced at several seasons of the year in certain localities in Dominica, if the work is conducted by clear minds and skilful hands.

These sets are small onion bulbs raised from seed in one season and planted out in the next. This method has been successfully tried on a small scale in other West Indian islands, as for instance, in Antigua, by importing sets during the months of August and September, which mature a crop much earlier than seeds planted at the same time. On the other hand, there have been reports from the Antigua Experiment Station of the failure of imported sets of Bermuda onions to form bulbs. The success with locally grown Teneriffe sets in Dominica is therefore encouraging.

Regarding manurial experiments, the Spring Hill experiments have shown that land receiving pen manure produced watery onions, the keeping qualities of which were indifferent. Land which received a dressing of wood-ashes produced good solid onions possessed of excellent keeping qualities.

The experiments at Spring Hill have been on a considerable scale, the whole crop, both that raised from seed and that from sets, amounting to about 28,000 lb. Mr. Jones considers that the island could easily supply its own wants in this direction, and possibly in course of time also develop an export trade, if a few young men would acquire the necessary knowledge to grow onions, and devote the necessary care and attention to raising the crop on their own properties.

With regard to this matter, it will be seen by reference to the *Agricultural News* of June 1, and November 2, 1918, that Mr. Seignoret did continue his planting with sets in suitable months with excellent results, having obtained good crops in March, July and August, especially in the last month.

A further sample of onions, just reaped by Mr Seignoret from sets raised from Teneriffe seed imported at the close of 1917, was received at this Office on March 11, 1919. It consists of twenty-seven onions neatly put together in a plait, and in attractive appearance compares favourably with any onions on the local markets. The whole string weighs 5lb 5oz., thus giving an average weight of a little more than 3 oz. for each onion. In diameter the onions range from about $2\frac{1}{2}$ to a little more than 3 inches. They are sound bulbs, and will be likely to keep well. The retail price of such onions in the Barbados market at the present time would be from 10*d.* to 1*s.* per lb.

Further information just received by Mr. Jones, with regard to the sample string of onions mentioned above as forwarded to this department, states that Mr. Seignoret did well with successive planting of sets each month from July to December 1918, with the exception of the month of September, the November-December plantings giving specially excellent results.

Mr. Jones considers that onion growers, in Dominica at least, should always use a portion of the seed which arrives from Teneriffe about September or October each year for the production of sets, and then by successive plantings of these sets monthly from May onwards a supply of onions might be secured all the year round. Until Mr. Seignoret's experiments were successfully made, it had been thought necessary to raise onions directly from seeds. It involves considerable labour to transplant all the seedlings at one time, therefore the adoption of the plan of raising sets and growing onions monthly from them will considerably reduce the trouble and labour required. Mr. Seignoret's experiments have shown that the best method of onion growing in Dominica is to raise a part of the crop directly from seed, to mature during February and March, and to use the rest of the seed for the production of sets, which may be stored and utilized for successive plantings as described above.

Mr. Seignoret is to be congratulated on his produce, and we wish him all success, not only with his crop, but in his further experiments in the local production of onion seed.

GLEANINGS.

Helium gas was first discovered in the sun by Sir Norman Lockyer, and twenty-six years later was identified on the earth by Sir William Ramsay, the two distinguished men who were founders of the British Science Guild. The Americans are now producing this gas in large quantities as a non-inflammable gas for the inflation of air ships.

The sun-drying of vegetables at Quetta has aroused a considerable amount of interest throughout India, and numerous requests for these products have been received. As far as can be seen at present, there is every prospect of a new and profitable industry being created in Baluchistan in the growing of vegetables for sun drying. (*Bulletin No. 8*, Agricultural Research Institute, Pusa.)

According to the *India Rubber World*, January 1, 1919, one of the weeds which is being exploited as a source of rubber in Germany is *Sonchus oleraceus*. This is a cosmopolitan weed, well known throughout the West Indies, usually under the name of 'sow thistle'. It is stated that this plant contains valuable green and yellow dyes, wax, a flexible fibre useful in paper manufacture, and a latex capable of being utilized for the production of rubber.

Prof. J. B. Harrison, C.M.G., in a memorandum on the use of artesian water for irrigation in rice cultivation, states that as a result of experiments there cannot be any doubt as to the suitability of artesian well water, although it is anaerobic in composition, for the irrigation of rice, although it is now certain that to obtain full crops when using this water, it is necessary to till the land by ploughing and forking so as to aerate it fully prior to planting the paddy.

The spread of the water hyacinth (*Eichornia crassipes*) in some of the rivers of Assam presents a formidable problem. The agricultural departments are doing their best to combat the pest by showing how it can be profitably converted into ash, which will make a valuable manure. If it is left to spread unchecked it will soon choke all the tanks and waterways of the province, with results that are serious to contemplate. (*Indian Trade Journal*, November 8, 1918.)

Utilization of the husks of the cacao beans has occupied the attention of numerous chemists and agriculturists. Among the uses to which the husks have been put is their employment in cattle and other stock food. Experiments have shown that cacao shells are fattening fodder for cattle, and that the daily yield of milk from cows is considerably increased as the result of the use of this material. (*Proceedings of the Agricultural Society of Trinidad and Tobago*, December 1918.)

A Canadian whaling company has been canning whale meat for a number of months in British Columbia. The species of whale taken on the coast yields 3 to 12 tons of prime meat. Samples of the canned product are being sent out, and 1,000 cases have been already shipped to Samoa and Fiji. For the frozen product orders have been already received for over 1,000 tons, the bulk of which is being shipped to Boston. (The *Chamber of Commerce Journal* January 1919.)

Tomatoes ripen and colour from within outward. The fruits will acquire a perfect colour if they are picked as soon as they are grown to full size. When the surface colour begins to change from a dark green to a distinctly lighter shade with a very little tinge of pink, the fruit may be picked. They should be spread out in the sunshine for a time. Fruits free from cracks and of splendid colour may be obtained by enclosing the fruit in paper bags on the plants some weeks before they ripen. (The *Queensland Agricultural Journal*, December 1918.)

The Potato Association of America states that there is a promise of great development in the production of potato flour. The Chief of the Dehydration Division of the Association stated recently that potato flour is destined to become one of the staple food products of the country. Bakers and housewives all over the nation are rapidly becoming familiar with its advantages. Capitalists are awakening to the possibilities of its manufacture. He added that in a few years he expected to see potato flour mills in every big potato-growing district in the United States. (*The Board of Trade Journal*, January 23, 1919.)

In the cotton inspector's report, St. Vincent, for the month of February, in connexion with the destruction of the food-plants of the cotton stainer, a curious fact is mentioned. In searching for silk-cotton trees in order to destroy them he found that in two cases the whereabouts of the trees in the forest were deliberately concealed by the neighbours for the following reason: that the trees attracted the manicou—a small opossum; these animals are shot for food, and it is said that they feed on the flowers of the silk-cotton.

According to *Nature*, February 6, 1919, Mr. Alexander Whetmore has published in the *Proceedings of the United States National Museum*, Vol. LIV, an account of bird bones found by him in kitchen midden deposits in the islands of St. Thomas and St. Croix. Altogether thirteen species are represented in these deposits. One or two species are now no longer found in a living state on St. Croix, and this is attributed to the fact that the early French settlers, somewhere about 1650, burned off the densely wooded covering of the whole island in order that they might render it more healthy. This conflagration of course entirely changed the character of the flora and fauna, and this fact has to be borne in mind by students of geographical distribution.

The report for the year ended December 31, 1917, of the Department of Agriculture of Trinidad and Tobago, brings out the growing importance of the cane farmer by comparing the returns of 1907 with those of 1917. In the former year estate canes contributed 35,597 tons of sugar to the colony's total of 50,564 tons, i.e. 74 per cent. In 1917 estate canes contributed almost the same figure but of a total of 70,891, i.e., .51 per cent. In other words, cane farmers who produced 26 per cent. of the crop in 1917 produced 49 per cent. in 1917. In numbers the cane farmers have greatly increased in the same period: West Indian from 5,777 to 8,984, and East Indian from 6,557 to 12,055.

PRUNING CITRUS TREES.

An item of great importance in citrus cultivation is the pruning of the trees. When the young tree is removed from the nursery much of its root system, especially the fine feeding roots, has been cut away, so that it is necessary to reduce the top in order to give the root system a chance to recuperate, and also to provide a strong frame work for the future tree. The *Queensland Agricultural Journal*, December 1918, gives some useful hints on this subject.

Only a limited number of branches should be left—not less than three, nor more than five—as these branches eventually become the main limbs of the trees. The mistake is often made of leaving too many branches, with the result that they are too crowded and weak, so that when they are laden with fruits they are unable to bear the weight, and frequently break down. This is often the case with mandarin orange trees, which are apt to produce a dense growth of weak wood unless the main limbs are properly established, and subsequent growths severely thinned. If the tree is not pruned out properly, it will probably yield a great crop of undersized fruits one year, and very little fruit the next.

No citrus tree should be allowed to grow into a dense bush. A typical citrus tree should have one main trunk, from 2 to 3 feet high, with not more than three to five main branches, and these main branches should only be allowed to carry sufficient subsidiary branches to form the frame work of the tree. All others should be removed.

The inside of the tree should never be crowded; the limbs should be properly spaced, and the outer branches on which the fruit is produced should not only shade the inside of the tree, but the ground under it. The ground requires shading from the heat of the sun.

Many citrus growers are afraid to prune hard enough, but there is frequently much more harm done to trees by too little pruning than by too much. Properly pruned trees produce regular crops, as they make a good growth annually, but underpruned trees are very apt to bear a large crop one year, and consequently to make little new growth, so that the following year they only produce a small crop, because they have to make wood for the next season.

The pruning of the lemon is different from that of the orange or mandarin, because the long straggling growth which the lemon is prone to throw out must be kept well shortened in order to encourage the production of fruit-producing lateral branches. In pruning the lemon therefore, the main object is to encourage the lateral growth on which the fruit is produced, and to discourage the production of long straggling branches.

The foregoing remarks apply to the pruning of young and healthy trees, but it often happens that another class of pruning is necessary, namely pruning old trees for renovation. If such pruning is carefully carried out, many an apparently worthless tree can be made to produce a profitable crop. The bearing wood of many old trees frequently becomes useless as the result of drought, neglect, starvation, want of pruning, insect or fungus pests, etc. The roots of such trees should be carefully examined, and if they are found to be healthy the trees can be renovated by proper treatment. This consists of removing the top of the trees, cutting back all limbs to sound healthy bark and wood, and removing all dead or superfluous branches. The trees should be then painted or sprayed with a strong solution of lime sulphur. The ground round the tree should be well worked up, and a good application of manure given. This work should be done when the tree is more or less dormant, and as soon as the rains come young shoots will make their appearance all over the tree, which should be carefully thinned out, only leaving enough to form a well-shaped new top. If this work is carefully carried out, an old tree which was practically useless will have a new head of vigorous growth, and will continue to bear good fruit, and if it is then properly looked after, it will continue to yield a profitable return for many years.

PROPER PACKING OF HEVEA SEEDS.

Many complaints have been made in the past as to the poor germination of consignments of Hevea seeds from one country to another. In the *India Rubber Journal*, December 28, 1918, an article by J. G. A. Maas records the writer's conclusions after a series of experiments conducted with a view to finding out to what the speedy loss of germinative power was due, and what measures should be adopted in preserving and dispatching Hevea seeds to obviate rapid deterioration.

The experiments have led to the following conclusions, and given the following practical results:—

All measures to be adopted in the preserving and dispatch of seeds should be directed towards the prevention of drying up. The seeds dry up quickly, and thus lose a large proportion of their germinative power. For preference, collect the seeds daily, otherwise every two or three days.

Do not let the freshly collected seeds lie in the open, but protect them from drying up. Note carefully not to let them lie in the sun, and do not spread them out thinly, even on sheltered floors, not even when the seeds have to lie not more than a few days.

Do not preserve or dispatch seeds in air-tight or close soldered tins. This is only admissible in a low temperature, e.g. below 10° C. Many seeds die in closed receptacles, probably as a result of suffocation and moulding.

The dipping in wax of each individual seed—with or without previous disinfecting—in the manner, for example, in which cacao fruits are treated, is probably quite good under certain conditions. It is, however, laborious.

For the dispatch of seeds, use cases not larger than 30 by 40 by 50 centimetres, of strong timber, e.g. 15 millimetres thick, with strengthening pieces on the corners.

Line the cases on the inside with oil paper, Japanese paper, or rough packing paper, and divide up the contents, when filling, with several folds of stiff paper in three or four layers. The paper lining on the inside serves to oppose drying up, and the dividing up in layers prevents the seeds and packing materials from getting separated by the shaking in transit.

Use, as packing material, something which will retain the damp, and dampen that material intentionally when filling the cases. A good material for this purpose is powdered coco-nut refuse mixed with soil or crushed charcoal. Freshly crushed charcoal acts as a drier. The charcoal should be dampened. A little damp clay mixed or not mixed with charcoal, is also a good packing material. Do not use too little packing material.

When stored in a temperature of 5° to 10° C., the germinative power of Hevea seeds remains well maintained. Not very much packing material need therefore be used, and packing in bottles or tins can also be done without packing materials. That is the temperature of the refrigerators of large ocean steamers. In eventually importing limited quantities of new material from the place of origin of the Hevea trees, this method would appear to be of great utility. In this temperature the seeds do not germinate during the journey.

PLANT DISEASES.

OBSERVATIONS ON EELWORM (UFRA) DISEASE OF RICE.

In view of the investigation now proceeding of the eelworm (nematode) disease of coco-nuts in the West Indies, the following observations reported by Dr. E. J. Butler (*Scientific Reports of the Agricultural Research Institute*, Pu[illegible]17-18) on the conditions under which the related p[illegible]ice can ascend the stem, are of interest. Recent obs[illegible]ations seem to indicate that in the coco-nut disease, infection takes place among the young leaves and not by way of the roots:—

Evidence was obtained both in pot cultures at Pusa and in a field experiment carried out in collaboration with the Bengal Department on Dacca farm, that this disease can be sometimes conveyed by seed from an infected crop.

The laboratory work at Pusa during the past season was directed chiefly to a study of the conditions which enable or induce the parasitic eelworm (*Tylenchus angustus*, Butl.) to leave the water of the paddy fields, and ascend the plant to reacsh its susceptible portion near the apex of the shoot. In last year's report it was explained that atmospheric humidity around the plant was the determining factor, the worm being unable to move out of water except at bigh humidities.

The exact measure of the humidity of the air on the surface of a plant is exceedingly difficult to ascertain. It is, however, possible to grow paddy in enclosed chambers, and measure the relative humidity of the air within the chamber It is also possible to watch the movements of worms on glass slides kept in similar chambers. By these methods, using a polymeter, it was found that the worms can move freely when kept on glass slides at a relative humidity of 95 (temperature 87° to 90° F.), but not all at 90, the exact point being apparently near 95. On the living plant they can move at lower air humidities, certainly below 90 but not at 75, at the same temperature. If they can soon reach the inner folds of the shoot (which is noly possible in young seedlings), they become less dependenton high air humidity than when they remain on the exposed surface, no doubt because the vapour of transpiration causes the confined air within the folds to reach higher degree saturation that that of the surface.

Temperature also influences movement, but less regularly. For instance, worms when free in water are much more sluggish at 73° than at 88° F., provded they have not fed recently, but active, well-nourished worms, taken directly after feeding, show little difference in motility at the two temperatures. At low temperatures there is ordinarily little tendency to ascend shoots projecting out of the water, even when the air is approximating to saturation, but here again freshly fed worms seem somewhat more active than those that have been dried for some time.

Light is also a factor, but the results so far obtained require further testing.

Starvation is a factor of great importance. In one experiment two batches of 20 worms were placed in drops of water on slides in a saturated atmosphere, one batch containing only worms that had not fed for 18 days, the other, worms taken after they had access to living young paddy shoots. In 24 hours all but 4 of the former batch had left the water and were wandering freely in the chamber, whereas in the other batch, none had left the drop. Four days later only one was left in the first drop, while 19 were still in the second.

Hence amongst the factors which control the wanderings of the worm in search of food that it can only obtain from the living paddy plant, some, such as humidity, are absolute, in that they impose conditions which rigidly limit the power to move, while others are relative, in that they act through the instinctive or other vital processes of the worm, and so influence its movements indirectly, and are more variable in their action.

VELVET BEANS AS A STOCK FOOD.

In the *Agricultural News*, Vol. XVI, p. 316, there was a notice of a paper, read before the St. Kitts Agricultural and Commercial Society by Mr. R. E. Kelsick as to the value of velvet beans (*Stizolobium* sp.) for stock feeding. Since then enquiries have been made at this Department with regard to quantities advisable as a ration to various animals. The following, taken from *Farmers' Bulletin*, 962, United States Department of Agriculture, is of interest in this connexion.

With dairy cattle at the Tennessee station velvet-bean meal mixed with an equal amount of cotton-seed meal in the beginning was taken with a relish. Later it was readily consumed alone as the entire grain ration. In no case, however, was it fed in greater amount than 10 lb. per head per day. In a preliminary test in feeding velvet-bean meal in comparison with cotton-seed meal, 9 lb. of the former was hardly equal to 6 lb. of the latter.

From several experiments made by J. M. Scott in feeding velvet beans for milk production at the Florida station, the following results are noted. In the first experiment, with velvet beans fed in the pod, milk was produced at 13·3c. per gallon, as compared with 13·7c. per gallon when cotton-seed meal was fed. In the second experiment, with wheat bran used as a supplementary feed, the cost of producing a gallon of milk on the velvet-bean ration was 12·7c., and with a cotton-seed meal ration, 15·6c. the latter costing 22·8 per cent. more than the former.

At the Tennessee station it was found that, with hogs, velvet-bean meal (pods and beans) could not well make up more than one-third the ration. Fed alone it was unpalatable to them. The South Carolina station reports that pigs on a ration of two-thirds velvet-bean meal and one third corn meal made again during the experiment of 77 lb., an average of 0·916 lb daily, at a consumption of 4·68 lb. of the ration per pound of gain and a cost of 8·89c. per lb.

At the South Carolina station a ration of two-thirds velvet-bean meal and one-third corn meal was compared with one of two-thirds soy bean meal and one-third corn meal for fattening hogs. With the former 4·68 lb. of the feed made 1 lb. of grain, while with the latter 7 24 lb. of feed was required per pound of gain. With the velvet-bean meal the animals gained 0·916 lb. per day at a cost of 8·89c. per lb. With the soy-bean meal, the average gain per day was 0·548 lb. at a cost of 13·97 c. per lb.

This question is also referred to in the *Agricultural News*, Vol. XVII, p. 325, where the value of these peas as a food for hogs is pointed out. The name velvet bean is applied to several species of stizolobium, which are also designated by other vernacular names, such as Florida velvet bean, Bengal bean, etc, but all the species seem to possess very much the same characters.

SOIL AERATION.

In the *Scientific Report of the Agricultural Research Institute*, Pusa, 1917-18, it is stated that the decision of the Baluchistan administration in 1911 to start a small experimental station near Quetta for the study of local questions has, in one direction, suggested far-reaching developments in Indian agriculture. In the Quetta valley the texture of the soil is such that after surface flooding, ventilation is very easily impeded, with disastrous results to the crop. The investigation of this matter led to the recognition of the importance of soil aeration as a factor in crop production. During the years 1912-14 a number of observations and results had accumulated at Quetta, which appeared to be most easily explained, on the assumption that the stiff soils of the valley suffered from want of aeration, and that in the removal of this factor lay the best line of advance. A similar explanation seemed to underlie numerous other results and observations made in the plains of India and elsewhere. The available evidence in favour of this view having been published, was the means of setting in motion a great deal of experimental work both in India and other countries. The connexion between surface drainage, soil aeration, and crop production, and the increase in yield which follows the slightest improvement in surface drainage has been clearly demonstrated.

During the past year careful experiments have been conducted both at Pusa and at Quetta on the effect on the yield of the addition of inert materials, such as potsherds and sand. In all cases increased yields have been obtained both in the case of cereals and of leguminous crops. Similar results have been obtained on a large scale on an estate in Bihar, where in 1918 the best yield of wheat was given by the plot to which 1 inch of broken tiles had been added to the soil. That such results are possible can only be explained in one way, namely that the aeration of the soil had been effective. The increased yield is due to the increase in oxidation which follows the improvement in the porosity of the soil.

The existence of the soil aeration factor furnishes an explanation of the low yields of poor quality which always follow over irrigation on alluvial soils. The texture of these soils deteriorates after being flooded with water. As the soil dries under the hot sun, the surface bakes into a hard crust largely impermeable to air. Each successive irrigation destroys the soil texture more and more, and the surface crust becomes more and more impermeable to air. The effect of irrigation on alluvial soils therefore, interferes with the ventilation. Irrigation removes one limiting factor, the want of water, but it introduces another, namely the need of aeration. Successful irrigation, therefore, involves the working out of a practical compromise between the two conflicting factors, water and air. The aim of the irrigator must not be the mere application of water, but the provision of water in such a manner as to interfere as little as possible with the aeration of the soil.

Confirmatory evidence of the importance of soil aeration in agriculture has been abundant in recent agricultural literature. For instance, in the central provinces of India, Mr. Clouston, the officiating director of agriculture of the central provinces, has shown that poor laterite soils, of which there are millions of acres which have hitherto only borne occasional crops of inferior millet in the rains, and have been considered useless for agricultural purposes, in reality possess, in their porosity and good drainage, enormous potentialities. With the addition of organic manure and irrigation wa er, very fine crops of various products have been obtained.

Mr and Mrs Howard of Pusa, and Mr. Hole of Debra Dun, have done great service to agriculture in calling attention to the importance of drainage and soil aeration as soil factors which count for even more in crop production than manuring.

The necessity for drainage, in order to maintain soil aeration, most especially in orchard crops such as limes and cacao, has been frequently and consistently advocated in the publications of the Imperial Department of Agriculture for the West Indies.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of January 1919:—

GINGER.

There has been very little demand throughout the month for this article. At auction on the 23rd of the month washed Cochin was quoted at 110*s.*, rough Calicut 105*s.*, Japan 80*s.*, and African 95*s.* per cwt. Pimento likewise has been very dull at an average rate of 4*d.* per lb. Nutmegs were fairly represented at auction on the 9th of the month when some 61 packages of West Indian were offered, and 19 sold at the following rates: 118's at 1*s.* 3*d.* 81's to 91's, slightly wormy, 10*d.* to 10½*d.* Some 40 bags of garbled Bombay were also sold 76's to 85's at 1*s.* 5*d.* to 1*s.* 6*d.*, and 90's to 103's. 1*s.* 3½*d* to 1*s.* 4*d.* At the first auction on the 9th of the month mace was represented by 26 packages of West Indian, bright curly pale fetching 2*s.* 5*d.* per lb., fair to good bright pale to reddish 1*s.* 10*d.* to 2*s.* 1*d.*, ordinary red to fair pale 1*s.* 5*d.* to 1*s.* 7*d.*, and pickings 1*s.* 1*d.* to 1*d.*

SARSAPARILLA.

At auction on the 15th of the month sarsaparilla was in abundant supply as follows: grey Jamaica 62 bales, 28 of which were disposed of, fair to good sound realizing 3*s.* 8*d.* to 3*s.* 10*d.* per lb., while for partly damaged by sea-water, and mouldy, 2*s.* 6*d.* to 3*s.* 6*d.* was paid, and for badly sea-damaged 2*s.* was realized. Of other kinds offered but none disposed of were native Jamaica 133 bales, Lima-Jamaica 41 bales, Honduras 28 bales, and Mexican 54 bales: 3*s.* 6*d.* per lb. was the price asked for the Lima-Jamaica, 3*s.* 9*d.* for the Mexican, and 4*s.* 6*d.* for the Honduras.

ARROWROOT, CITRIC ACID, LIME JUICE, LIME OIL, KOLA, AND TAMARINDS.

At auction on the 9th of the month 286 barrels of St. Vincent arrowroot, common to dull fair were offered, and all bought in at from 10*d.* to 1*s.* At the beginning of the month citric acid was quoted at from 4*s.* 8*d.* to 4*s.* 9*d.*; a week later it was to be obtained at one penny cheaper, and at the close the price stood at 4*s.* 7*d.* to 4*s.* 7½*d.* At the early part of the month it was reported that large quantities of West Indian lime juice had arrived in London, but there were no quotations as to prices. At auction on the 16th of the month West Indian distilled oil of lime was disposed of at 5*s.* 6*d.* per lb., while hand pressed fetched 16*s.* At the some auction kola was fully represented by 266 packages, only one of which found a buyer at 8*d.* per lb. for fair bold halves, St. Lucia. At the same auction as many as 105 barrels of West Indian tamarinds from Barbados were offered in bond, and were held at 90*s.*

MARKET REPORTS.

London.—The West India Committee Circular, February 6

Balata—Venezuelan Block, 3/3½ to 3/4; Sheet, 3/9.
Beeswax—No quotations.
Cacao—Trinidad, 90/-; Grenada, 85/-; Jamaica, no quotations.
Copra—£40.
Honey—West Indian, no quotations.
Lime Juice—Raw, 3/- to 3/6; concentrated, no quotations.
Pimento—4*d*.
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, January 21, 1919.

Bay Oil—Firm, at18*s*. to 20*s*.
Lime Oil—Slow, at 5*s*. 6*d*. to 6*s*. for West Indian distilled, and 16*s*. to 17*s*. for hand-pressed.
Orange Oil—West Indian commands 8*s*. to 8*s*. 6*d*. per lb.

Barbados.—Messrs. T. S. Garraway & Co., March 15.

Arrowroot—$10·00 per 100 lb.
Cacao—$19·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—No quotations.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—Dark Crystals, $5·50.

Trinidad.—Messrs Gordon, Grant & Co., March 5

Cacao—Venezuelan, $18·50 to $21·00; Trinidad, $17·50 to $21·50.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 20c. per lb..
Copra—$4·50 per 100 lb.
Dhal—No quotations.
Onions—$6·00 to $6·50 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $3·00 to $3·50 per 100 lb.
Rice—Yellow, $13·00 to $14·00; White, $9·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs Gillespie Bros & Co., February 25.

Cacao—Caracas, 18c. to 18½c.; Grenada, 17c. to 18c. Trinidad, 18c. to 19c.; Jamaica, 15c. to 15½c.
Coco-nuts—Jamaica selects, $50·00; Trinidad $51·00 culls, $26·00 to $27·00 per M.
Coffee—Jamaica, 16c. to 19c. per lb.
Ginger—16½c. to 19c. per lb.
Goat Skins—Jamaica $1·05; Antigua and Barbados, 90c. to 95c.; St. Thomas and St. Kitts, 90c. to 95c.
Grape Fruit—Jamaica, $3·00 to $3·50.
Limes—Nominal $6·00 to $6·50.
Mace—40c. to 42c. per lb.
Nutmegs—25c. to 26c.
Oranges—$3·00 to $3·25.
Pimento—7½c. to 8c. per lb.
Sugar—Centrifugals, 96°, 6·80c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

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	PAGE.
Agriculture in Barbados...	111
Alcohol, Industrial, Demand for in the United Kingdom	101
Beet Sugar Industry, European, present Position of	99
Cassava Experiments in Trinidad	109
Cotton:—	
Cotton Exports from the West Indies	103
Egyptian Cotton	102
Sea Island Cotton Market	102
Cotton in Barbados, Close Season for ...	105
Cotton Production, Advances in	97
Departmental Reports ...	110
Dominica, Rainfall in 1918	104
Gleanings	108
Guinea Corn as a Fodder Crop	103
Hawaiian Sugar Industry, Development of ...	100
Hedge Plants, Desirable	105
Insect Notes:—	
The Connexion of Skin Diseases in Cattle with Ticks	106
Items of Local Interest...	111
Jamaica Imperial Association...	105
Lime Cultivation in Dominica	100
Market Reports	112
Notes and Comments...	104
Plant Legislation in Antigua, Recent	105
Sisal and Henequen ...	106
Trinidad Agricultural Exhibition	104

Advances in Cotton Production.

THE type of cotton which has been found profitable, agriculturally and commercially, in the West Indies is, as is well known, the long staple Sea Island variety. There is but a limited production of this in the world, and it commands a higher price than any other type of cotton, owing to certain characteristics of length and fineness, which cause it to be in demand by spinners for the manufacture of special fabrics. Hence, having practically but little competition to face in the market, although many difficulties are experienced in producing this type of cotton, the growers of Sea Island have found themselves, especially under the influence of war conditions, in the position of being recently well content with the prices received for their crop.

It may however be discovered that Sea Island cotton, or some other variety able to compete with it as to its distinctive features, can be grown in other places outside the rather restricted area to which it is at present confined, and that therefore, an increased output of long staple lint might result, such as would inevitably lead to a serious drop in price, owing to the competition which would be set up among producers, and which would naturally be taken advantage of by buyers for manufacturing purposes.

As was pointed out in the editorials of the three previous numbers of this Journal, industrial competition in all products will have to be faced, and only by strenuous endeavour and intelligent co-operation can agriculturists hope to win through. So far, the West Indies have succeeded in producing the very best type of cotton, because the growers have realized, for the most part, that it is vital to their interests to endeavour energetically to put into practice the very best methods of plant selection and cultivation, and to co-operate with each other and with government departments in carrying out any measures deemed necessary for the welfare of the industry as a whole.

The probability that serious competition in the production of superior grades of cotton will occur in the near future is shown by the results of efforts made by growers in the United States to produce quantities of a long staple cotton equal to Egyptian.

Egyptian cotton has hitherto held a place of its own in the cotton markets of the world, as is pointed out in another article of this issue. Because of its

peculiar value for certain spinning purposes, a very large quantity of Egyptian cotton has been annually imported into the United States—no less than 339,854 bales of 500lb. each in the year 1915-16. In recent years, however, after many experiments in plant selection and methods of cultivation, it has been found that by the application of scientific principles, a grade of cotton quite equal to Egyptian—indeed it is claimed to be superior, except with respect to the very finest Egyptian—can be produced in Arizona and California. In these States no less than 15,966 bales of this superior type of cotton, valued at $5.482,000, were produced in 1917. It will thus readily be seen that Egyptian cotton on the American market has to face nowadays a very serious competitor.

The following extract from *Bulletin* No.742 of the United States Department of Agriculture sums up the conclusions reached as to the methods whereby this industry has attained its present position, and whereby it is likely to be very widely extended. The advice given deserves to be carefully studied by all those interested in the cotton industry of these islands:—

'The experience gained in connexion with the establishment of the community growing of Egyptian cotton in the Salt River Valley makes it possible to formulate the conditions which appear to be indispensable to the successful production of this crop in the United States. These are, briefly, (1) a growing season of about nine months, or several weeks longer than is required to mature a full crop of Upland cotton; (2) a reliable supply of water for irrigation; (3) labour sufficient to pick the acreage planted; (4) absence of other types of cotton in the locality, as otherwise pure seed and a uniform fibre cannot be maintained; (5) an acreage sufficient to warrant the purchase of roller gins and other equipment and the employment of a competent classer in order to market the cotton in even-running lots of commercial size; and (6) the co-operative organization of the growers for the purpose of maintaining the seed supply, operating the gins, and marketing the crop.

'The history of the establishment of Egyptian cotton production in the Salt River Valley is believed to have more than a special or local interest, since it offers a good illustration of the numerous biological, agronomic, social, and economic difficulties encountered in developing a new agricultural industry, and furnishes suggestions as to how these complex and diversified problems may be successfully solved. That co-operation is the keynote of success has become very clear in the progress of the present enterprise. In this instance co-operation has been maintained along the following lines:—

'(1) Co-operation among the investigators has brought to the solution of the special problems different equipments of technical training and knowledge, and different points of view, while their collective judgment has been focussed upon matters of general policy. The cordial and effective co-operation of the administrative officers of the Department of Agriculture has also been an important factor in this connexion.

'(2) Co-operation among the growers has made it possible to produce and market the crop economically, and to maintain the uniformity and high quality of the variety grown.

'(3) Co-operation between the growers and the investigators has made it possible to put into effect without delay the most improved methods of production and marketing. This co-operation has been maintained by personal contact, since, in addition to the field agents of the department who have worked constantly in the community, members of the Committee on South-western Cotton Culture have made frequent visits to the Salt River Valley. The attitude of the officers and members of the growers' associations in their co-operation with the Department of Agriculture has been of the most cordial and helpful character, and has been a very important factor in the establishment of the industry.

'(4) Co-operation with the cotton manufacturers on the part of both investigators and growers has also contributed largely to the development of the industry. Manufacturers have assisted most willingly and effectively in making spinning tests of the product from time to time, and in furnishing both to the Department of Agriculture and to the growers' associations, useful information concerning the cotton. This information has guided the growers to better methods of handling the product, and has given the investigators helpful suggestions in connexion with the breeding work. Some of the manufacturers interested in this type of cotton have visited the Salt River Valley in order to learn at first hand the condition and prospects of the industry, while representatives of the growers' associations and the Department have been welcome visitors at mills where the cotton is being utilized.

'The policy of the Department of Agriculture in encouraging the production of long staple cotton on the community basis is beginning to be appreciated by manufacturers and buyers, many of whom now realize

that, in order to obtain year after year ample quantities of cotton of unchanging character, they must look to localities where the farmers are organized to grow only one kind of cotton, to prevent deterioration of the type by seed selection, and to class and market their crop as a unit.'

It will be seen from the above extract what great importance is attached in the United States to community action in cotton growing, a point that has been consistently emphasized by the Imperial Department of Agriculture for the West Indies, and which cannot be too strongly urged. It is quite impossible to maintain, much less to improve, the production of Sea Island cotton without community action directed to a number of ends.

What has occurred with regard to Egyptian cotton in the United States may very possibly occur with regard to Sea Island cotton, if not there, in some other country. In face of such competition, nothing but the very highest type of product would have a chance of obtaining a good price on the market. It is therefore of real importance that the West Indian cotton growers should whole-heartedly combine to continue producing the highest type of cotton along scientific lines. In fact one may go further and say that, it is necessary to use every effort to improve both type and yield, both of which ends are well within the range of possible achievement. To rest satisfied with things as they are is a mistake in agriculture. Much direction and advice can always be obtained both from other growers and from the officers on the staff of the various agricultural departments, and of these it is well for cotton growers to take every advantage.

THE PRESENT POSITION OF THE EUROPEAN BEET SUGAR INDUSTRY.

A review of the European sugar industry at the end of the war is contributed by Dr. H. C. Prinsen Geerligs to the *Louisiana Planter*, March 1, 1919. It would appear that the production of beet sugar in European countries continues its downward course, for whereas in 1913-14 the production of sugar in European countries was 8,161,400 tons, for 1918 19 it will only be 3,805,000 tons.

The causes of this decline are situated only for France in the direct consequences of the war, because in that country numerous sugar-houses have been wrecked or damaged or dismantled to such an extent that out of the 206 factories existing before the war, only sixty-one have been able to do work in this year.

In all the other European sugar-producing countries the indirect consequences of the war have occasioned the sharp decline in the production. In the first place, the lack of supply of foodstuffs and fodder from overseas has stimulated the culture of potatoes, breadstuffs, oil plants and the like, to the detriment of that of sugar beets, while also the area planted with swedes, turnips, and similar hoe crops has been greatly increased, bringing along a reduction in that devoted to sugar beets.

In many instances this decrease in the area planted with beets has been made voluntarily by the growers, but in many other cases they were compelled to do so by Government regulations.

Besides all these reasons there is still a very bad factor in Russia, where since the revolution, the conditions for work are so bad and so disturbed that it is not clear how matters will come to their own again. In the part of the land still belonging to the old Russia, the production of sugar has come down from 300,000 tons to a mere 70,000, while in the other parts as Ukraine and Poland, the crop appears to be about one-half of the former figure, but no reliable data are to be had, and the figure in the list is only an approximate one.

On the other hand, the consumption of sugar has been greatly increased, and had to be contingented, if the nations did not want to be threatened by a complete absence of that article a long time before the advent of a new crop. The armies and navies consumed much more than their individual members would have done if they had been allowed to remain in their quiet civilian occupations, and further, a not inconsiderable quantity of sugar was used as a raw material in the manufacture of explosives.

The civilian population, too, extended its sugar consumption, because of the lack of butter and fat to be smeared on bread, and because of a great many other articles of diet having vanished from the bill of fare. The bad, gray and unpalatable bread had to be combined with honey, jams, marmalades and the like, in order to be able to be eaten with the least possible amount of disgust, and all this demanded sugar and sugar again. It soon became evident that where the home production failed, the importation from abroad was rendered impossible either by the blockade or by the U-boat warfare, or by both; and where the requirements for the armies and navies had to be satisfied above all, the consumption of the civilians at home had to be greatly rationed in every European country, while the amount of sugar put at the disposal of the industries using sugar as a raw material was cut down in most places to one-fourth of that in peace times.

At the end of the great war, at the moment of the signing of the armistice and of the beginning of peace negotiations, we see in Europe a bad sugar crop just ended, with very short stocks from the foregoing crop, and very very little chance of importing sugar from overseas, save for England, France and Italy. A severe scarcity of sugar is to be added to the already existing shortages of fat, bread, meat, coffee, tea, spices, fodder, milk, in short, of every article of food, and no visible way of escaping famine.

Moreover, in various countries voices are heard advocating the monopoly by Government of the sugar trade, thereby levying a high duty on sugar as a means to pay off interest and amortization of the war loans, and where a monopoly is not yet planned, a great increase of the sugar duties is contemplated, also with a view to increase the revenue of the exchequer. The consequence of both measures will certainly be a restriction of the sugar consumption in the countries concerned.

The prospects of the European sugar industry are anything but bright, and although the armistice is concluded, and perhaps peace is at last in sight, the various reasons enumerated above which have co-operated to decrease the production, will last still a very long time, and will very probably keep the European sugar production at a much lower level than it used to occupy.

THE DEVELOPMENT OF THE HAWAIIAN SUGAR INDUSTRY.

In 1875 when the Hawaiian reciprocity treaty was first effected by the United States with the Hawaiian kingdom, the sugar production of the islands was so small as to be almost negligible, perhaps 30,000, or 40,000 tons. In endeavouring to secure the American reciprocity treaty, so that the Hawaiians could send their sugars into the United States free of duty, the statement was made that it would be impossible for that country ever to produce over 75,000 tons of sugar. The sugar producing Hawaiians were very skillful and very enterprising, and the production of sugar in the Hawaiian Islands grew with reasonable rapidity. We have before us now a memorandum of the ten years' production from 1909 to 1918 inclusive. The data are given in short tons of 2,000 lb., and in 1909 the crop reached 535,156 tons; the following year the crop was about 181,000 tons less, and the next year, 1911, resulted in a crop of 566,821 tons. Then came 1912 with 595,258 tons; 1913 with 546,798 tons; 1914 with 617,038 tons; and 1915 with 645,445 tons, reaching the largest crop which we have on record, and then receding to 593,483 tons in 1916, with 644,574 tons in 1917, and 1918 with 576,842 tons.

The sugar industry in Hawaii has set the pace for all the world, and we find that the industry has progressed until it has increased about eightfold from the figures that were claimed to be the limit of production in 1875.

These figures will show that the maximum production in Hawaii is nearly reached, the evenness of the production during the ten years under consideration indicating the accuracy of this presumption. This is evidently having some influence in Hawaii, as we find that some of the leading planters there are now looking to the Philippines, where the field for sugar production is practically unlimited, and where the large native population gives promise of a full supply of labour.

We believe that the consumption of sugars will increase throughout the world, and, because of the cheapness of sugar, that the production is not likely to exceed the consumption. There will always be an increasing demand for sugar. (The *Louisiana Planter*, March 1, 1919.)

LIME CULTIVATION IN DOMINICA.

I. PROTECTION FROM WIND, AND DRAINING.

In the Report on the Agricultural Department, Dominica, for the year 1917-18, a general review of which appears on another page of the present issue of this Journal, a large portion is naturally devoted to various problems connected with the lime industry. Mr. J. Jones, Agricultural Superintendent and Curator of the Botanic Gardens, is an expert in questions relating to the cultivation of the lime tree; his views therefore have special interest and value. It is intended to publish in these pages a series of articles reproduced from his report, as tending to the benefit of growers of limes in general.

A lime experiment station was started in April 1913 on Government land beyond Morne Bruce, and within easy distance of the Botanic Gardens. March 31, 1918, saw the completion of five years' work in this station.

The expenditure on the station for the five years was £650, while the receipts from the produce amounted to £466 15*s* 11*d*.

The financial results are not unsatisfactory, and from now on there should be a considerable increase in the receipts, and only a small increase of expenditure. The excess of receipts over expenditure during the next five years should be sufficient to provide a small up-to-date factory, after which the experiment station should be a source of profit.

The special value, however, of the work at this experiment station arises from the important information which is being obtained bearing upon problems connected with the cultivation of lime trees. This information on points such as protection from wind, draining, manuriug and mulching, budding and other methods of propagation, pruning and general care of the trees, as affecting the yield, all tends to more efficient cultivation, and to the benefit of the lime industry.

On taking over the land there were found to be about 4 acres of lime trees twenty years old, which had been abandoned for many years. About 2 acres of these were growing on steep lands, and the remainder on slopes of a moderate fall. On the latter it was possible to start eight manurial plots of ¼-acre each. The trees were originally planted 12 feet by 12 feet, but on the plots these were thinned to 24 feet by 24 feet. This removal of three trees out of every four appeared to be a drastic measure, but the results fully justified the work. The effect of drainage and manure on the health, growth and yield of the trees was remarkable.

The area now under bearing limes, and young trees just commencing to bear is 7½ acres. To this must be added 5 acres in course of being established. Another 3 acres will be planted shortly, which will bring the total under lime cultivation to over 15 acres. There is also the possibility of further additions in the future. The crop during the twelve months ended March 31, was 649 barrels of fruit.

Protection from wind. The upper part of the experiment station, which is now nearly established in limes, is exposed to the prevailing winds. To protect the cultivation, wind belts of the well-known Pois doux (*Inga laurina*) are being formed. Up to the present the cultivation has been helped by subsidiary wind-belts of the Nicaragua shade tree (*Gliricidia maculata*), a quick growing and useful plant for this purpose. A considerable amount of protection was also afforded to young limes by *Tephrosia candida*, a leguminous plant grown as a green dressing.

The lower part of the station, a portion of which it is hoped to establish in limes as time goes on, is a straight and narrow valley, down which the wind rushes. The slopes in some instances are too steep and exposed, and the layer of soil too thin to plant, but the depressions will grow limes if surrounded by wind-belts. The poor and exposed lands can be used to grow certain plants for use as mulches, or native and exotic trees for use as firewood.

Happily this matter of wind-breaks is well understood in Dominica. A very large part of the area under limes in the island is protected from the wind by the natural conformation of the land, of which every advantage is taken by planters. Where the land is exposed, experienced men seek to mitigate the effect of the wind by growing shelter-belts of the Pois doux, Galba, and other trees. It is only the young and inexperienced who do not see the need of providing shelter in the first instance. By failing to do so they add greatly to the cost of establishing their plantations, and buy their experience at a ruinous price. Whenever new lands exposed to the wind are about to be planted, a carefully thought out scheme of wind-belts should be planned, and carried into effect as early as possible.

Reference has been made to the use of the Nicaragua shade tree (*Gliricidia maculata*) as a secondary wind-belt. This plant has proved very helpful in the experiment station. Cuttings of about 3 feet long, of which a foot should be placed in the ground, are found to strike readily and rapidly. If small holes are made for the cuttings, and these are placed in the ground with care, there are no failures. Unfortunately, on some estates the holes are made with an iron bar, and the cutting is then forced into the hole. This action strips off the bark, and the cuttings cannot emit roots. It requires

the same care to place a cutting in the ground as it does to place out a plant.

For use as a secondary wind-belt, a row of *Gliricidia maculata* should be run between every third and fourth row of limes across the direction of prevailing winds. It needs to be cut back twice a year. A few weeks after being topped it is again affording some protection, and on each cutting it yields a good supply of mulch for the lime trees. In order not utterly to deprive the young lime trees of shelter at the time of cutting back, it is best to top alternate rows every three months. This tree is deciduous, but by topping it is kept in an evergreen state practically all the year round, and is made by these means to afford protection even in the dry season of the year. Planted on either side of a permanent wind-belt like Pois doux it is helpful in bringing on these plants during the early years of their existence.

Draining. It may be stated that this cultural operation is generally neglected on the majority of lime estates, until it becomes urgently necessary. It is then usually carried out in such a manner as to give an additional check to the already severely tried trees, and to add to the immediate difficulties of the management.

When draining operations have at last to be carried out on established estates, owing to the low vitality of the trees, the work, in the majority of cases, is done in a very unsatisfactory way. Work which should be done gradually, and extended over at least three seasons, is attempted at a single operation. The drains are usually made too narrow and too deep for their width. The earth, which is chiefly subsoil, is thrown upon the adjoining surface soil. Thus, a living soil, from which the trees derive their nourishment, is largely covered by a dead soil, which needs a lengthy exposure to the sun, air, and rain, and to the effects of weed growth, and to applications of organic manures, before it becomes fertile and helpful to the lime trees. This covering of the living surface soil often to a depth of several inches gives a further check to the trees, and although draining, even when carried out on unsound lines, will ultimately result in some improvement, the immediate effect of faulty operations is to further delay the recovery of the plantation. In old cultivations in which draining has been neglected, it would prove a sounder plan to drain gradually by instalments, rather than to attempt the whole of the work at one time.

In new plantations these operations should be carried out during the years between the time of planting and the coming into bearing of the trees, that is, a period of three or four years. On flat and moderately undulating lands a drain should be run between each two rows, for under such conditions the trees would be spaced at 20 feet to 25 feet apart or more. This plan results in what is called the 'bank' or 'bed' system, that is, the soil from the drain is thrown up until the highest level is in a line with the row of tree stems, whence it gradually falls on either side to the drains. Thus on flats, and on moderately undulating lands, the fields are formed of a succession of beds. This plan is formal in appearance, and effective in its operation.

When fields have been lined and planted with limes, which is usually done between June and November—the wet season—steps should be taken the following dry season—January to May—in the work of beginning a system of drainage which, if carried out on sound lines, will be destined to play a great part in maintaining the health of the trees, and in prolonging the life of the plantation.

During the first dry season after the trees are planted, surface drains about 2 feet wide, and 10 to 12 inches deep, should be dug. The soil from the drains should be spread over the land, to which it will afford a light top dressing. The next season the sides of the drain should be broken in, and the top dressing repeated. The third year the drains should be deepened a few inches in order to afford the annual dressing. By this time, the 'bed' system will be attained, but as drains always tend to silt up, especially so in a wet country like Dominica, they should be annually cleaned, and kept at a proper depth. This secures a valuable top dressing for the trees each year. Procedure on the above lines is very helpful to the young limes. Under such conditions they show great vigour. By the time the draining system is complete, the trees are commencing to bear.

It is practically certain that draining, as outlined above, when applied to lime trees in course of being established, will mitigate the critical period in the life of young lime trees, and it may, in conjunction with shelter, such as is given by Tephrosias aud Indigoferas, overcome it.

In many instances in Dominica limes are planted on steep slopes. The usual custom in these cases is to plant closely, 10 feet by 10 feet, or 12 feet by 12 feet, nothing or very little in the way of drainage being attempted. The trees under these conditions do fairly well whilst young, but once having passed the vigorous stage characteristic of the first years of maturity, their appearance and yield of fruit are decidedly poor. This is largely due to surface washing, by which the best soil is carried away each season on the occasion of torrential rains. It would appear that a good deal more could be got out of such cultivations by planting at wider distances, and by following the plan of surface drains recommended on flat or moderately undulating lands. Experiments with a view of obtaining information on this point have been started at the experiment station.

It is almost needless to point out that surface drains on slopes should always run across the fall of the land, and be able to deliver the water to the main drains slowly, and with a minimum of rush. In a hilly country like Dominica, the main outlets are usually rivers or streams, ravines, or natural depressions in the land.

It must not be overlooked that considerable areas of limes are grown and do well in Dominica on what may be termed boulder lands, that is, land strewn with rocks to such an extent that very little soil is to be seen. Such areas are usually naturally well drained, which is fortunate, as the ordinary methods could not be applied in these instances.

The Demand For Industrial Alcohol in the United Kingdom.—Previous to the war most of the industrial alcohol needed in Great Britain was imported from Germany, although its use, except for its recent utilization in the production of munitions, was much less than in other countries. It is estimated that there will be an increased employment of motor vehicles with higher power than before the war, and that, to meet this, 100,000,000 gallons of motor spirit will be required annually by the United Kingdom.

The British Government is desirous of being independent of petrol, owing to its high cost, and because the supply comes mainly from foreign countries. The employment of industrial alcohol mixed with benzol as a substitute for petrol, is being seriously considered. It is thought that the alcohol which has been produced for munition purposes is equally suitable for motor purposes.

The Government has recently appointed a Commission to enquire into this question, and to ascertain what quantities of industrial alcohol are available within the Empire, and the sources of supply. (*Weekly Bulletin, Department of Trade and Commerce*, Canada, February 24, 1919.)

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended March 1, 1919, is as follows:—

ISLANDS. The demand has continued again this week far the odd bags classing Fine to Fully Fine, the buying being on account of the Northern Mills. The supply of this quality available out of the crop is now reduced to 400 to 500 bales, for which there is a good deal of inquiry, and the outlook is that this limited supply will be sold any day. As previously advised, we think this quality better in grade, staple, and fineness, than any selection we can make out of the Georgia and Florida crop, and, therefore, that it is relatively the cheapest cotton offering.

Of the unsold stock remaining on hand much the larger proportion is more or less off in preparation.

We quote, viz:—

Fine to Fully Fine, @ 53½c., f.o.b. and freight.

Fine to Fully Fine, slightly off in preparation, @ 52c. to 52½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. The Savannah market is quiet, with limited demand, but there is more doing in the interior markets, where the better grades, Extra Choice and Fancy, are sought after, but the supply is small. It is almost impossible to fill orders for Fancy, consequently the buying is restricted to Extra Choice aud average Extra Choice. The better grades are becoming very scarce.

We quote, viz.:—

Extra Choice, @ 52½c.53c., f.o.b. and freight.

Average Extra Choice, @ 51c. to 51½c., f.o.b. and freight.

The exports from Savannah for the week have been: to Northern Mills 100 bales. There were no exports from Jacksonville this week.

EGYPTIAN COTTON.

The following extracts from an interesting article under the above heading, which appeared in *The Times* Trade Supplement, February 1919, are reproduced as containing matter for reflection with regard to the cotton industry of these islands:—

It is hardly possible to exaggerate the importance and value of the cotton crop to Egypt. It forms a very large proportion in value of the total exports of the country. Judged by the proportion of the population engaged in its production, the cotton crop again ranks easily first in importance. As a matter of fact, practically the whole agricultural population of the country is more or less dependent on cotton. Not only so, but a very large proportion of the non-agricultural population is indirectly interested in the handling of the cotton crop in one way or another.

It is not surprising, therefore, to find that practically every problem in Egypt, social, economic, agricultural, and even political, revolves round cotton. The irrigation policy of the country, its fiscal policy, its banking system—everything is dominated by the cotton crop.

The question of quality is naturally of the first importance in regard to Egyptian cotton, for its special position in the world's cotton supplies depends entirely upon its quality. That has been true all through its history. When during the cotton famine of the sixties Lancashire was searching the whole world for an alternative supply to that of the Southern States, Egypt was only one of many countries that came to the rescue to the best of its ability and its own very considerable profit, but it was practically the only one that maintained afterwards something of the position it had won during the Civil War. Its peculiar qualities of fineness and strength had been recognized, and Lancashire had realized that the long-stapled Egyptian cotton was nearly as good as the only other class of stapled cotton then known, namely Sea Island, for many purposes, and, owing to its strength, even better for some.

It will be seen from any account of the recent history of the Egyptian crop that it has during the last few years suffered very seriously, especially in quantity. As regards quality, the position is more uncertain, but not satisfactory if a long view ahead be taken.

The only real competitor with the fine grades of Egyptian cotton has all along been the Sea Island supply from the Atlantic States of Georgia and Florida, and the islands off the coast of Charleston, South Carolina. There are two distinct grades of Sea Island. The first, the real 'Islands' cotton is the very best in the world, running as high as 2½ inches staple, and nothing can compete with it for the special purposes for which it is used, such as the finest sewing cotton, the superfine yarns used for the lace trade, and the finest fabrics generally. This cotton will spin as high as 300's, which means that 150 miles of the yarn would only weigh 1 lb. The second grade is known as Floridas and Georgias, which are not quite so long in staple nor so fine in quality as the Islands, but are used for similar purposes where the quality required is not quite so superfine. For some time before the war the finest grades of Egyptian cotton had been coming increasingly into competition with these second grade Sea Islands, and the prospect thus opened up to the Egyptian grower was one of great profit. For the supply of Sea Island has never been enough to meet the potential demand of the world for these very fine fabrics, and in two directions alone—the supply of aeroplane cloth and of fabric for motor car tires—there was apparently no limit to the demand. The supply, however, was strictly limited. Of the real Islands cotton there was only a crop of about 10,000 bales and, say, 5,000 more from the West Indies. The Florida and Georgia supply varied greatly in different seasons, say, from 60,000 to 100,000 bales, so that there was ample room for the best cotton that Egypt could produce. The most satisfactory feature of the development that was going on in Egypt before the war was the increase of these fine grades, and it is probable that Egypt now produces several hundred thousand bales of Sakel, the best of which is equal to all but the best of Floridas and Georgias. Still more promising was it that the most recent results had given ground for hoping that the new areas near the sea, when reclaimed, would give even better results than any that had hitherto been attained in the Delta. For it is a striking fact that the Sea Island cotton never grows at its best except near the sea, and some of the new varieties which had been produced in Egypt had given much better results when grown experimentally nearer the sea.

Nothing finer than Sakel has yet been heard of in Egypt, but the reclamation of the Northern Delta where such varieties would be most likely to succeed, has been suspended by the war. At the same time the United States authorities are making great efforts to develop new areas in Arizona and California, where, under irrigation conditions, long staple varieties similar to Egyptian are now being produced in considerable quantities. In 1917 the crop in these areas was only 14,000 bales, but for 1918 it is estimated at 45,000.

COTTON EXPORTS FROM THE WEST INDIES.

The following figures show the quantity and estimated value of Sea Island cotton exported from the West Indies for the quarter ended December 31 1918:—

Colony.	Quantity in lb.	Estimated value, £.
Grenada	nil	nil
St. Vincent	21,309	3,552
Barbados	nil	nil
Montserrat*	164,153	23,592
Antigua	nil	nil
St. Kitts	208,155	31,223
Nevis	112,445	16,867
Anguilla	46,002	6,900
Virgin Islands	11,554	385
Trinidad	nil	nil
Total	563,618 lb.	£82,519

There was also exported from Grenada 20,160 lb. of Marie Galante cotton of an estimated value of £1,100

*The cotton exported from Montserrat comprised 150,405 lb. of clean lint, valued at 3*s.* per lb., and 13,748 lb. of stained lint, valued at 1*s.* 6*d.* per lb.

GUINEA CORN AS A FODDER CROP.

Jamaica has long been pre-eminent among the British West Indian islands in the matter of stock raising, the dairy farms of the Liguanea Plains north of Kingston being extensive. Yet even in Jamaica it would appear, from a lecture delivered to the Liguanea Agricultural Society by Mr. L. L. Carrington, printed in the Jamaica *Gleaner*, February 27, 1919, that little attention has been paid to raising fodder crops, that is to say, crops cultivated for the express purpose of feeding animal stock; with the exception of Guinea grass and Para grass, reliance has been placed almost entirely, as in all the other islands, on pasturage, along with cane tops, and together with some amount of grain grown on the spot perhaps, but more frequently purchased from outside.

In his lecture Mr. Carrington points out the uneconomic nature of this proceeding, and suggests that more use might be made of permanent fodder crops on stock farms. Among these, after referring to sugar-cane as a fodder crop, he unhesitatingly gives the first place to Guinea corn. Much of his remarks on this crop are reproduced below.

Guinea corn grows under any circumstances. If carelessly cultivated it yields accordingly; on the other hand, if any particular attention be bestowed upon it, the increased returns are in themselves warrant enough for a continuance of the good practice.

Its value as a fodder lies not only in its nutritive content, but in its palatability. It is readily consumed by all animals, which in all feeding tests is a requisite. Taken at the right stage it contains quite a degree of sweetness, and may be successfully used as a diluent, when chaffed, to dry or coarse Guinea grass.

The product from one Guinea corn seed may be 20 or 30 stalks, and may be cut back two or three times the first year, and possibly twice the next year. Maize never recovers from a set-back, whilst Guinea corn seems to be able to exist under the most adverse circumstances, and to recover from a severe check with great rapidity. So long as a plant attains a height of, say, 12 to 11 inches, it will resist a three or four months drought, even on the Liguanea Plains, and will readily endeavour to make up leeway if subsequently encouraged by favonrable seasons and cultural effort.

If well established before the drought becomes serious, it is one of the last plants to quail.

The time to plant is not a definite one. Any seasonable weather will do. Many say August is the best month, as the plant flowers in November, and yields grain in January or February. It should be cut before seeding, if fodder is the object.

It is now suggested that, in order to serve this purpose best, planting be started as early in the year as seasons will permit, say the second week of March, or early in April.

Early planting in a moderately favourable season would give a small cutting in June or July when the need for succulent feed is pressing. It is possible also to get another cutting in September, and still have sufficient growth before flowering time.

Remember not to allow the Guinea corn to do more than flower if required for fodder, that is, it must not seed. If cut back before seeding, the plants will spring up and yield again from January onwards.

The June or August planting is the one to reserve to bear fruit for seed or for use as grain. This should never be cut until the grain has ripened. Should land be available, plant all the year round, as there is no fixed season of maturity. It may be cut as required at any stage of growth, or may be kept in reserve.

It is said that in certain stages of growth it is poisonous to stock. The truth is that the great point in feeding stock is to avoid sudden changes or excesses of any kind. If dry Guinea grass has been the feeding for some time, do not begin to feed Guinea corn by the 100 lb. per head per day. Begin with 5 to 10 lb., and gradually increase, say in three or four days, to 90 or 100 lb. as required. In the States certain sorghums, to which class our Guinea crop belongs, are thought to secrete poisonous properties in some stages of growth; but no experiments on poison tests carried out with our native Guinea corn have yielded really positive results. It may therefore be fearlessly fed to your best cows or horses always with due regard to moderation.

In order to reduce the cost of establishing a field of Guinea corn there is no reason why a crop of cowpeas may not be planted up the middle of the rows. If planted along with the corn, it will establish itself before the corn becomes too tall.

In feeding, particularly in drought, a chaff cutter is a necessity. Neither sugar-cane nor Guinea corn may be used to the best advantage without a good cutter. The whole cane including the top should be chaffed along with Guinea grass, however dry, at the rate of about 1 part to 5.

If Guinea corn is being fed, treat it in the same way, 1 part corn to 5 parts grass.

Damp the chaffed stuff with water, or molasses and water, and then thoroughly mix with it salt and some meal stuff. Animals will eat the chaff without meal, but it is more relished if a trifle of meal be added. If a regular ration of grain feed is allowed, distribute it over the chaff feeds.

Horses, cows, and goats may be fed in this way, and though it will be found to be a little troublesome, means will always suggest themselves of lessening the drudgery.

A cow in milk would take from 5 to 10 kerosene tin fulls. In order to avoid waste it is suggested giving a little at a time until it is discovered how much each animal will eat.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial draws attention to the progress made in the world's cotton production, especially of the finer grades.

The connexion of skin diseases in cattle with ticks is referred to under Insect Notes on page 106.

The first part of an important article on lime cultivation in Dominica will be found on page 100.

On page 106 there is reproduced an article on sisal and henequen as grown in Jamaica.

Rainfall in Dominica in 1918.

Copies of rainfall returns of Dominica for 1918 have been forwarded to this Office by Mr. Joseph Jones, the Curator of the Botanic Gardens. From these it appears that the mean rainfall for fifteen leeward coast stations was 78·85 inches; for two windward coast stations, 134·33 inches; for two inland stations, 160·73 inches; and for eight Lasoye stations, 118·56 inches; thus making a mean rainfall for twenty-seven stations of 100·80 inches. The highest total recorded was at Governor, and the lowest, as usual, at Batalie on the leeward coast. Compared with the rainfall of recent years, that of 1918 is the lowest recorded since 1912. In 1917 the mean for thirty stations was 110·53 inches, while in 1916 it was 125·70 inches for thirty-three stations, and in 1915 it was no less than 137·11 inches for thirty-four stations.

It is difficult to draw any rigid conclusions as to the difference in the mean rainfall in Dominica in successive years, owing to the fact that there are variations in the number and situation of the stations from which returns are obtained. Thus, in 1916 there were records from eleven inland stations, where heavy rains are experienced, and in 1918 only two inland stations provided records, which may account to som eextent for the diminished mean.

Trinidad Agricultural Exhibition.

The agricultural exhibition was held on March 14, at the Government Farm, St. Joseph, and was opened by His Excellency the Governor. 'Amid the picturesque surroundings of St. Joseph', says the Trinidad *Guardian*, March 15, 'no more ideal spot could be chosen for the holding of an agricultural exhibition.' In its report the *Guardian* points out that a remarkable feature of this year's exhibition was the absence of useless and inferior exhibits, whereby those of real worth were brought more prominently forward. Among the general exhibits there was an exhibit of manufactured cocoa, in addition to many products of the coco-nut, especially first class oil. An uncommon exhibit was one of gru-gru nut oil, an article not unknown in the Windward Islands.

The success of the silk industry in Trinidad was shown by an exhibit from a local manufacturer of silk in all its stages, and in various kinds. The silk, in small quantity, is regularly shipped to Lyons.

The exhibits of the Department of Agriculture, which occupied the centre of the buildings, were various and attractive, including samples of sugar, cacao and coffee, rubber and cotton, stock feeds and lime products, together with specimens of growing plants producing the various crops. There were also good exhibits of cattle, goats, and pigs from the Department's farms. A noticeable exhibit, though not sent for competition, was that of stock from the Ste. Madeleine estate, of horses, mules, donkeys, goats, and pigs, all of a high degree of excellence.

It is evident from the report given in the *Guardian* that this year's exhibition was a great success.

Desirable Hedge Plants.

Reference to the editorial of the *Agricultural News*, March 13, 1915, will show how this Department has advised the growing of hedges as advantageous to all forms of cultivations in these islands. In the same editorial there was a list given of some plants that are known to form satisfactory hedges. An addition to this list was noticed in a short article in the issue of April 10, 1915.

In the *Rhodesia Agricultural Journal*, December 1918, there is some advice as to plants suitable for forming cattle-proof hedges on Rhodesia. Among these there are a couple which grow freely in the West Indies, but of which no notice has apparently been taken as suitable plants for hedges. One of these is *Duranta Plumieri*. This is a very showy shrub or small tree, which blooms almost through the year in small racemes of pretty blue flowers. After the disappearance of the flowers, the clusters of small yellow berries which succeed them are almost as attractive as the bloom. The stems are somewhat thorny, and if planted fairly thickly and kept clean, it would seem to be, as the Rhodesian journal claims for it, a good strong hedge.

This shrub, which is known in many of the West Indian islands as 'pigeon berry', grows easily from seed. The berries may be planted *in situ*, or preferably in a nursery, to be transplanted when about 6 inches high.

Another plant recommended in Rhodesia is Bougainvillaea, especially the two species *glabra* and *spectabilis*. This is used as an ornamental hedge in some of the West Indian islands, and is certainly of strong enough growth to form a close hedge of any height or width which may be desired. The blaze of colour in the flowering season, which is almost the whole year, makes it a most showy object. The two species of Bougainvillaea mentioned above grow easily from cuttings inserted in the ground. Until growth starts, they should be kept well supplied with water. The plants are extremely hardy, and when established, will stand long periods of drought.

Recent Plant Legislation in Antigua.

The Colonial Secretary of the Leeward Islands has forwarded to the Imperial Commissioner of Agriculture a copy of a Proclamation, dated March 5, 1919, which has been issued in Antigua, forbidding the importation of all citrus plants, and parts of citrus plants, including their fruits, from British Guiana or any island or place in the West Indies, except the islands of Dominica, Montserrat, St. Lucia, and Grenada.

This step has been taken as a precaution against the introduction of the disease of citrus trees known as 'blossom blight' or 'wither tip', which is in existence in British Guiana and in several West Indian islands. The introduction of this disease would lead to disaster to the lime industry of any of the Leeward Islands.

Another Proclamation in Antigua, dated February 26, 1919, forbids the importation of growing or sprouted coco-nuts into that island from Trinidad or Grenada, to avoid the introduction of the 'red ring disease', which exists in those islands. An account of this disease was given by the Mycologist on the staff of the Imperial Department of Agriculture in the *Agricultural News* of February 8, 1919.

It may be noted that these Proclamations have been issued in accordance with the advice of the Imperial Commissioner to the Government of the Leeward Islands.

The Jamaica Imperial Association.

The first annual general meeting of the Jamaica Imperial Association was held at the Association's office in Kingston on February 18, 1919, at which the first annual report was read. This report, which was printed in full in the Jamaica *Gleaner* of the same date, is interesting reading. In a notice of the formation of the Association in the *Agricultural News*, June 1, 1918, the objects of the Association were pointed out. The report just presented shows that the Association's activities during the past year have been numerous and important, and attended with a great deal of success. In the first place the Association was successful in influencing the Government in the direction of providing a sum of money for combating ankylostomiasis, which has led to the commencement of a regular campaign carried on by the Rockefeller Foundation. With regard to the industries of the island the Association has emphasized the need for co-operation in each one of them, and by the appointment of sub-committees to deal, each with one particular industry, benefits have accrued to them all.

It is evident that this Association, consisting as it does of prominent and far-seeing men interested in the development of Jamaica, although in no respect a Government institution, must be of the greatest possible value as a medium of communication between the Government and those concerned with the various industries of the colony.

Close Season for Cotton in Barbados.

The enforcement of a close season for cotton has been consistently advocated by the Imperial Department of Agriculture for the West Indies, and from time to time the passing of Ordinances for that purpose in the different islands has been noticed in the pages of the *Agricultural News*. In the Supplement to the *Official Gazette*, Barbados, March 27, 1919, an Act is published under the authority of the Governor, Council and Assembly of the island, to provide for the destruction of old cotton plants, and for the establishment of a close season.

This Act orders: (1) that no cotton plants or stumps shall be left growing on any land after the thirtieth day of April in any year, and that on or before the said date, all cotton plants and stumps shall be dug up and buried or effectually destroyed by fire; (2) that no cotton shall be planted on any land in the island between the first and thirty-first days of May inclusive in any year. It is satisfactory to know that now all the smaller islands interested in the cultivation of Sea Island cotton have laws to enforce a close season for cotton.

INSECT NOTES.

THE CONNEXION OF SKIN DISEASES IN CATTLE WITH TICKS.

In the *West Indian Bulletin*, Vol. XV, p. 36, there appeared a paper on Skin Diseases of Cattle in Antigua, by Mr. P. T. Saunders, M.R.C.V.S., formerly Veterinary Officer to the Imperial Department of Agriculture for the West Indies. This disease was supposedly identical with a disease of cattle which existed also in Guadeloupe, and was known there as *farcin de boeuf*.

In Guadeloupe the disease was said to affect horses and mules as well as cattle, whereas in Antigua Mr. Saunders found it confined to cattle only. The disease was considered by Mr. Saunders to be probably due to fungus infection through wounds in the skin, and that the lesions following the punctures of the 'Gold tick' (*Amblyomma variegatum*, F.) were the principal seats of infection, although other wounds caused by thorns, barbed wire, and other means ought also to be taken into account.

Mr. Nowell, the Mycologist on the staff of the Imperial Department of Agriculture, reported after investigation of the matter contained in such wounds, that at least two of the various fungoid organisms which he found therein might be likely to be the cause of a skin disease.

The diagnosis of this disease, and its connexion with the punctures of the skin effected by Amblyomma, which were put forward by Mr. Saunders, tend to be confirmed in a paper by Mr. E. M. Jarvis, which was published in the *Veterinary Journal*, February 1918, on Ixiodic Lymphangitis during the German East Africa Campaign, 1916-17. A summary of this paper, which appeared in the *Review of Applied Entomology*, January 1919, is given below.

The paper describes a number of conditions due to the secondary infection of wounds caused by the bites of ticks in horses, mules, asses, and more rarely cattle and sheep. The micro-organisms concerned include the Preis Nocard bacillus (*Cryptococcus farciminosus*) occasionally, the necrosis bacillus, staphylococci, etc. In Southern Rhodesia the disease was almost entirely spread and mechanically conveyed by a tick, *Amblyomma variegatum*, but it seems to have disappeared from there since tick eradication was effected. It is stated that an examination of over 1,000 cases in 'German' East Africa showed that 75 per cent. contracted the disease through the agency of Amblyomma and 20 per cent through the agency of Stomoxys. The remaining 5 per cent. were directly inoculated through the entry of organisms by abrasions from thorns, etc. That this one genus of ticks should be so pernicious, is due to the length of the rostrum, to the habit of keeping the rostrum pendulous, and so scooping up the virus off contaminated ground, to the polyandrous habit aggravating the lesion, and to the considerable longevity of the tick, affording it an opportunity of leaving an infected host, and attaching itself to another. Stomoxys and Tabanids have been observed to infect unabraded tissue by direct inoculation, and tick birds may be mechanical carriers, as they peck at open wounds, and go from one animal to another. As regards prophylaxis, the author found in Southern Rhodesia that if ticks were pulled off within twelve hours no infection resulted, as the rostrum had not penetrated to the sub-connective tissue. In the East Africa campaign this measure proved fairly successful in the 4th S.A. Horse on the march. Even up to twenty-four hours the disease could be prevented by pulling the ticks off (rostrum and all), squeeziug the minute sinus which exudes a serous discharge, and painting with iodised phenol (1: 4). This method was eminently successful in South Africa, and all the B.S.A. police were supplied with a small bottle and brush, and not one case occurred in the force after its practical application. It could not be employed during this campaign as drugs were unobtainable. Under peace conditions, tick eradication, the destruction of flies and of refuse, and the segregation of malignantly infected wounds may be adopted, but this policy would require a few years.

It may be noted that the skin disease of cattle is attracting much less notice in Antigua at present, probably owing to the fact that more attention is being paid to tick control, and eradication by means of sprays and dips, and that these are proving efficient.

SISAL AND HENEQUEN.

The two fibre plants, to the cultivation of which attention is being seriously directed in some islands of the West Indies, are Sisal (*Agave sisalana*), and Henequen (*Agave fourcroydes*). There is a considerable area at present in Jamaica under these plants, and very valuable notes on the cultivation of them are contributed by Mr. William Harris, F.L.S., Government Botanist and Superintendent of Public Gardens, to the *Journal of the Jamaica Agricultural Society*, February 1919, most of which is reproduced below. As Mr. Harris says, much probably has to be learnt to secure the best results under local conditions. It is not advisable blindly to follow methods that are adopted in other countries, where possibly very different conditions obtain: exact knowledge can only be gained by experience. These notes appear to be compiled after considerable experience in the cultivation of the plants in Jamaica, and will probably be found useful to intending sisal growers in other of the West Indies.

Sisal (*Agave sisalana*) is more widely distributed than any other fibre-producing agave. Although it is a native of Central America and Mexico, it is not there cultivated for producing fibre for export. Henequen (*Agave fourcroydes*), also a native of Mexico, is the species cultivated in Yucatan for the production of fibre for export; and in the markets of America and Europe this fibre is usually also called sisal. In fact it constitutes more than 90 per cent. of the sisal fibre of commerce.

The leaves of the sisal plant are dark green or slightly glaucous, each 3 to 4½ feet long and 3 to 4¼ inches wide at the middle: each plant produces about forty to sixty of these leaves at a time. They are furnished with a slender dark-brown terminal spine, about 1 inch long, and usually there are no spines along the margins of the leaves, although occasionally they are furnished sparsely with small outward-pointing spines. The leaves of the henequen are produced on a trunk often 4 to 6 feet high; they are 80 to 100 per number per plant, and from 4⅛ to 5 feet long and 4 to 6 inches wide at the middle, of a light bluish-green colour. Unlike sisal, the henequen produces uniformly blackish spines straight or gently curved upwards, along the margins of the leaves. Both of these species produce a flower stalk or pole from 12 to 25

feet high, bearing clusters of yellowish-green flowers which are succeeded by young plants known as bulbils. The sisal is not known to produce seeds in Jamaica, Mr. Harris says, nor does the henequen, although it is stated that elsewhere the latter plant does produce seed capsules. The life of the sisal is from five to ten years, while the henequen, in appropriate situations, lives from ten to fourteen years or longer before poling. The method of propagation is either by using the bulbils or adventitious buds from the flowering pole, or the suckers from the base of the plant. It has been pointed out that the suckers are apt to pole at the same time as the mother plant, and it is therefore recommended that bulbi's be preferably used for propagating purposes. A single pole will produce from 1,000 to 4,000 bulbils. As soon as the bulbils drop off the flowering pole, they should be collected, and planted at distances of 6 to 9 inches apart in nursery beds, which should be kept weeded and cleaned until the young plants are large enough to be placed in permanent positions in the field.

It has been asserted that sisal will grow and flourish anywhere, no matter how poor the soil, but practical experience does not confirm this. On the other hand, wet or rich lands are not suitable, for though the plants may grow quickly in such situations, they are short-lived, and the fibre is poor in quantity aud quality. For sisal the best soil is that of dry limestone districts with broken rocky surface, where humus and red earth have accumulated. In many of these islands there are considerable areas of fairly level land on a limestone formation, where the underlying rock is porous, and such lands might be very suitable for sisal. Henequen, although naturally also a limestone plant, appears to thrive better in Jamaica on gravelly alluvium. Both plants delight in light and air, and should be grown where they have full exposure. It must be borne in mind that small plantations in isolated situations, unless close to a factory, cannot pay.

In very poor soils, planting at distances of 5 feet by 5 feet allows sufficient space for the plants to develop. This distance may, however, be considered the minimum for planting sisal, while on average soils, 6 feet by 6 feet, or even 6 feet by 8 feet would be advisable. As henequen is a larger growing plant than sisal, it should be planted not less than 7 feet 6 inches by 7 feet 6 inches apart.

In planting, holes should be made just large enough to receive the bases of the young plants, which should be taken from the nursery as required, all roots carefully pared off close to the stem, and each plant firmly planted in its hole just deep enough to keep it upright.

Clean cultivation is not absolutely necessary, but in order to keep down the grass and weeds, two weedings a year will in most places be sufficient. On no account, however, should bush be allowed to grow through the plantation. It has been found that loosening the surface round each plant, and mulching with the grass from between the rows has a beneficial effect.

The exact age for cutting the leaves will depend on the rate of growth, and this again will depend on the soil and rainfall. It may, however, be put down at from three to three and a half years after planting out in the field. There is no special season for cutting the leaves, as they are maturing all the time: it is generally understood that leaves are mature when they have reached an angle of from 45 to 60 degrees with the ground level. It must be observed that if the leaf is cut before the fibre is mature, this will be deficient in quantity and quality. The fact that a sisal leaf has attained its maximum dimensions does not necessarily indicate that it has arrived at maturity; sugar-canes, for example, are fully grown long before they are considered to be fit for the mill.

On the other hand, when leaves are ripe they should be cut, or they will begin to deteriorate, and over-ripe leaves will also yield a poor grade of fibre.

Fibre should be at least 3 feet long, and plants are ready for cutting when mature leaves of at least this length are to be obtained.

The first cutting will include all the lower leaves, many of which will be dead, and others too short or otherwise unsuitable for decorticating, but they should be removed close to the trunk; this is important in order that the butt end of the leaves shall be smooth and even; care must also be observed to prevent immature leaves being mixed with the ripe ones, as the fibre would thereby be materially depreciated in value. When the leaves are cut they should be made up into bundles of convenient bulk, say twenty-five in each bundle.

In the Caicos Islands fifteen leaves per plant per annum is said to be the average during the life of a plant, each leaf weighing from $\frac{3}{4}$ lb. to 1 lb. Elsewhere it is computed that the average number of leaves produced by the plants before poling is 140 to 180, each weighing $1\frac{1}{4}$ lb. Experience in Jamaica agrees fairly well with this estimate. Taking the weight of each leaf at $1\frac{1}{4}$ lb., with a minimum of $3\frac{1}{2}$ per cent. of extracted fibre, 1,000 leaves should give about 43 lb. of dry fibre on average soils.

Each acre on poor soils, carrying 1,452 plants at 6 feet by 5 feet, yielding, say, forty leaves per plant each year, calculating the weight at 1 lb. per leaf, and the extraction of dry fibre at 3 per cent., should produce 1,742 lb. of commercial fibre. The yield of fibre from plants at 6 feet by 6 feet in suitable soils in Jamaica is put at from $\frac{3}{4}$ to 1 ton per acre per annum, and the life of such plants after reaching the cutting stage should be at least three years; therefore each acre of sisal should yield from $2\frac{1}{4}$ to 3 tons of commercial fibre before replanting becomes necessary.

It is important that the fibre should be extracted from the leaves not more than forty-eight hours after they are harvested. When exposed to the sun and air for any time after being cut, the leaves lose their natural moisture, which is useful in cleaning them, and besides, a fermentation is set up, which if long continued injures the quality of the fibre. It is recommended that as soon as the flowering pole appears it should be cut down, unless bulbils are desired, for if it is allowed to grow, the upper leaves on the stem will not develop.

After the fibre comes from the decorticating machine, it should be hung on lines in the open air for several hours, but too rapid drying is to be avoided. During this bleaching process the greenish tinge of the wet fibre disappears. When the fibre is dry, and has been carefully graded it is made up into bales of about 400 lb. in weight and 20 to 22 cubit feet in size, and is then ready for shipment.

In this connexion, the grading of sisal must be emphaised. If the product is to obtain a good name in the market, it must be properly graded. Buyers, especially in large markets, desire to be certain of what they are purchasing, and this can only be secured by confidence in accurate grading. It is of vital importance for ultimate and permanent success in this industry to insist on absolute honesty and integrity in grading the fibre.

It is considered that, although sisal fetches a higher price in the market than henequen, the latter is a more profitable source of fibre in situations suited to it, because of its larger yield, namely up to 5 per cent. of clean, dry fibre.

GLEANINGS.

The refining of coco-nut oil is carried so far that a method has been discovered of entirely removing the peculiar flavour which rendered this substance unpalatable. The purity of the oil permits it to be blended with pasteurized milk, and to produce a butter as wholesome and palatable as the best dairy butter. (*Proceedings of the Agricultural Society of Trinidad and Tobago*, January 1919.)

The present financial condition of Grenada, as the Governor said to the Council on February 11, 1919, is decidedly a healthy one. The value of the exports in 1918 was £702,777. These exports were made up of the following: cacao, £519,365; nutmegs, £103,417; mace, £31,691; cotton, £23,155; lime juice, £14,255; miscellaneous, £10,894. The value of the imports was £390,333, showing the healthy margin of £312,444 in favour of exports.

The *Louisiana Planter*, February 15, 1919, states that the Department of Agriculture in Cuba is advocating the establishment of a distillery at every factory, on the ground that a ready market for the alcohol produced may be created locally to replace gasolene for driving motors. With gasolene at an average of about 45c. a gallon, a cheaper fuel is highly desirable, and the owners of gasolene-driven cars would profit as well as the producers of alcohol.

In the *International Sugar Journal*, February 1919, a brief note states that Dr. C. A. Browne points out that the name of the inventor of the hydrometer scale should be spelt Baumé, not Beaumé as is very often spelt. He was a Frenchman, and he based his scale upon percentages of salt. Its application to sugar solutions is therefore obviously irrational. On the other hand, the Brix scale, based on the percentage of solids directly present in a sugar solution, should be adopted generally in the sugar industry.

In general, for milch cows feed about 10 lb. weight of green food should be given for every 100 lb. weight of the animal, and 1 lb. of grain mixture for every 3 lb. of milk yielded. When the cow begins to go dry the grain feed should be gradually reduced to nothing, and again resumed about ten days before calving, a few pounds at a time, reaching the full ration three weeks after calving. (The *Journal of the Jamaica Agricultural Society*, February 1919.)

The *Journal of the Jamaica Agricultural Society*, February 1919, states that the Government are prepared to continue to buy corn for the next crop now being planted at 5*s.* per bushel shelled. They would also buy on the cob at 80 lb. for 5*s.* (80 lb. on the cob being considered equivalent to 1 bushel of shelled corn). The market for corn, the instability of which was in the past a drawback to corn growers, is now assured, and too much corn cannot be gorwn.

In an article on Javan sugar factories, *Sugar*, February 1919, points out that one of the principal reasons for the progress of the sugar industry in Java is the valuable assistance rendered by the experimental stations which are supported by the planting community at a large annual cost The agricultural section of the experimental station consists of one main station and five sub-stations at various districts of the island, at which investigations with regard to soils, fertilizers, diseases of canes, and varietal tests are made.

A plant for the production of potash from kelp has been installed on Moresby Island off the coast of B itish Columbia, which will have a capacity of dealing with 1,000 tons of wet kelp daily. The kelp is cut below the surface of the water by a machine similar to the hay mower, which is mounted on a flat barge and worked by a gasolene engine. The barge is propelled through the k·lp beds at a rate of about 4 miles per hour, and cuts in that time about 25 tons of kelp. (The *Canadian Manufacturer*, January 1919.)

Many people believe that it is possible to water the milk by giving large quantities of water to the cow. The *Agricultural Gazette* of New South Wales, November 2, 1918, draws attention to this belief, and states that M. Porcher, Professor of the Veterinary School of Lyons, has recently drawn attention to the researches and conclusions of several investigators on this point. The Professor concludes that the idea of watering the milk through the cow is nonsense, and that it could not be used as the basis for any reasonable judicial decision against a dairy farmer.

The Times Trade Supplement, February 1919, draws attention to the difference in density in bales of raw cotton from various countries. The density of the American bale is only about 22 lb. per cubic foot; the Egyptian , 37lb.; the average Indian, 45 lb.; while some Indian and Chinese bales are compressed to a density of 55 lb. to 60 lb. It is evident that high density baling means that a smaller number of ships are needed to carry a given quantity of cotton. There is some question however, as regards possible injury to long staple cotton by high pressure; hence, probably, the low density obtaining in America.

A simple plan for treating maize and Guinea corn seed before planting, to protect them from being eaten by ants, mice and birds, is given in the *Journal of the Jamaica Agricultural Society*, January 1919. Enough kerosene is mixed with a pudding pan of wood-ashes to damp them, but not to make a thin paste. The grain should be soaked for two or three hours in water, and then placed in the mixture and shaken well. The grains get coated, and may then be planted; it is not even necessary to shake them in a sieve to get rid of the superfluous wood-ashes. This is a clean and easy way of protecting seeds in the ground from attacks of enemies.

In Australia a special Committee of the Bureau of Science and Industry has reached the conclusion that, in order to increase the supply of industrial alcohol in the Commonwealth, permission should be given for the manufacture and use of 'power alcohol' denatured with 2 per cent. of either coal tar distillate or creosote oil; further, that an allowance of 3*d.* per gallon be granted by the Government on such material produced in Australia, by way of reimbursement of the extra cost caused by fiscal restrictions on the production; and finally, that a bonus of 3*d.* per gallon be granted in order to encourage the manufacture, and to develop the industries upon which the supply of the raw materials depends (The *International Sugar Journal*, February 1919.)

CASSAVA EXPERIMENTS IN TRINIDAD.

Considering the importance of cassava as a food crop, the following account of experiments at the Government Farm, St. Augustine, in Trinidad, is sure to be of interest and value to planters of this crop in other places. The account is reproduced from the *Bulletin of the Department of Agriculture, Trinidad and Tobago*, Vol. XVII, part 4, 1918:—

Considerable attention was directed to cassava cultivation in the colony in 1914 and 1915. In the former year the Careenage factory was opened for the preparation of cassava starch, and in the latter Mr. Vyvyan Board erected a temporary plant for the manufacture of cassava flour at Palmiste estate, having arranged with Sir Norman Lamont and Tennants Estates, Ltd., for the cultivation of the necessary acreage. The Board of Agriculture paid a visit to Palmiste in January 1915 to inspect the factory, and later in the day held a meeting at San Fernando, when the possibilities of a cassava industry were fully discussed.

In the course of this discussion it was pointed out that there was much to be learnt regarding the yield of cassava in Trinidad. No interest had been taken in it up to that time as a main crop, but judging by the results in other countries, a yield of 8 tons of roots per acre was a reasonable expectation. To secure this, however, experiments were necessary to ascertain the yields of varieties, the best distance to plant, when to plant, and when to reap, including under the latter not only the season of the year, but also the age at which the crop should be dug.

The early results were very disappointing, the yield per acre being low. Mr. Board left for active service, and the experimental factory was closed down. It is to be hoped, however, that the industry may be revived, and the Department has employed the waiting period in carrying on experiments to furnish information on the vital points referred to above. In this report Mr. de Verteuil shows that there is, as was anticipated, a large variation in the yield of local varieties, but that the 8 tons of roots per acre is obtainable from the better varieties. Of special interest are the records of yield of roots and starch per acre from plants of known age, from which the conclusions are drawn that, under the conditions at St. Augustine, the maximum return per acre is obtained by reaping cassava during the dry season, and apparently when not less than sixteen to seventeen months of age.

Experiments on the cultivation of cassava were started in 1914 at the St. Augustine Experiment Station, with the objects of ascertaining (*a*) the best local varieties, (*b*) the most suitable planting distance, (*c*) the best part of the sticks to select for planting, and (*d*) the best method of planting, i.e. on the flat, on banks, or in forked holes. This report deals with results obtained during 1917 and 1918. In addition to the above, two other items were included in the 1916-18 experiments with the object of ascertaining (*a*) the best planting season, and (*b*) the best age and time for reaping cassava.

It might be mentioned that in 1914 and 1915 attempts were also made for testing the suitability of planting cassava with other crops, such as corn, cotton, pigeon peas, and canes. In every case the result was a failure. Not only the yield of the cassava was poor, but the other crops either died back or gave very poor returns.

When the experiments were started in 1914, difficulty was experienced in obtaining reliable information from planters, large or small, with respect to the yield of varieties. In Trinidad, cassava is not grown as a separate crop, but usually as a catch crop in young cacao plantations as temporary shade, or in gardens of mixed cultivation. Very little information was obtained with regard to the yield per acre, the only information vouchsafed being that it was a good bearing variety—comparatively of course—as of the several varieties tried only one gave over 5 tons of roots per acre.

Out of fifteen varieties planted in 1916 and 1917 eight have given an average yield of over 5 tons of roots per acre. They were planted at a distance of 3 feet by 3 feet about May, and reaped in September of the following year, being approximately sixteen months old. The results obtained are as follows:—

Variety.	Tons per acre.	Variety.	Tons per acre.
Sellier	8·59	Parasol	6·32
No. 12	7·41	Mata Hotel	6·16
No. 13	7·14	No. 14	5·66
Turkey Claw	6·48	Maman l'enfant	5·53

Another variety, No. 15, gave 4·98 tons of roots per acre. Variety 'Sellier' is undoubtedly the best local variety so far obtained, individual plots of this variety having on three occasions given over 10 tons of roots per acre.

The results have been obtained without the aid of manures, and as it has been possible so far to detect the best yielding varieties under natural conditions, it is probable that better results will be obtained when artificial manures are avaliable at a reasonable price.

Four varieties were planted at distances of 4 feet by 4 feet, 3 feet by 3 feet, and 2½ feet by 2½ feet, respectively. Generally speaking, therefore, the highest yield has been obtained from plots planted 3 feet apart, but it has been observed that both Sellier and Maman l'enfant often give better results when planted 4 feet apart.

Sticks were taken as is usually done for obtaining plants. One or two plants were cut off from either end according to the length of the sticks—these would be the 'top' and 'bottom' plants respectively—the remaining portion being called the 'middle' or 'centre' plants. Two varieties were selected for the experiment, and the sticks planted at distances of 3 feet by 3 feet. In both cases 'the tops' gave the lowest yield, which confirms results previously obtained, namely that the younger or less mature portions of the stick are less suitable for planting purposes than the older portions. Similarly, the 'bottom' plants gave a slightly lower yield than the 'centre' plants, but the difference is not so marked. Nevertheless, the results clearly show that in order to obtain the best yield from a given variety, care should be exercised in selecting the sticks for planting, by rejecting the young and very old parts.

Experiments for comparing the relative merits of planting (*a*) on the flat, (*b*) on banks, and (*c*) in forked holes 2 feet square were carried out.

The results show that two of the varieties gave a larger yield when planted on the flat, whereas one variety gave its highest yield on banks, and the fourth in holes. Taken together, the average yield of these four varieties was 6·64, 6·27, and 6·24 tons of roots per acre for the plantings on the flat, banks, and holes, respectively. It may be pointed out that the soil at St. Augustine is of a naturally loose and friable nature, and that possibly on heavier soils higher returns may be obtained from banks and holes than from plantings on the flat. Nevertheless, should this be obtained, it is not probable that the increase yield would justify the extra cost of banking and holing, and therefore planting on the flat is generally recommended.

(*To be continued.*)

DOMINICA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1916-17.

It is satisfactory to note that the Curator reports that the beautiful Botanic Gardens in Roseau are, on the whole, making a good recovery from the effects of the hurricanes of the two preceding years, and that they are being more and more enriched by the importations of desirable trees and plants from other tropical countries. Among these may be noticed *Feijoa Sellowiana*, the pine-apple guava, and *Casimiroa edulis*, a Mexican fruit tree, although the conditions in the Gardens do not seem to suit these two very well. The Tonka bean tree (*Dipterix odorata*), on the other hand, seems to thrive well. Mexican varieties of avocado pear, and several varieties of choice Indian mangoes have also been successfully raised.

In recent years over thirty species of green dressings have been grown at the Botanic and Experiment Stations to find out which are best suited for growth in young lime orchards. The most useful under Dominica conditions appears to be *Tephrosia candida*, although, for a ground cover, the horse bean (*Canavalia ensiformis*) has given good results. Lime plants, however, require more than a ground cover. They need shelter, and this is afforded by Tephrosia, which grows to a height of 5 to 6 feet. It is contended that the idea that the growing of green dressings amongst young limes on estates is too expensive is a fallacious one. It is true that the preparation of the ground for planting the seeds costs more than ordinary weeding, but if a good growth of Tephrosia results, no weeding is needed for about eighteen months, and the soil is protected and enriched, while the trees are kept in a healthy condition. Lime trees at the Experiment Station, with Tephrosia as a nurse plant, are at four years from planting from 12 to 14 feet in height, and are bearing heavily. Other plants of the same age, grown without green dressing, are not more than half the size, and not likely to bear for some time. It is clear, therefore, that the use of leguminous plants as a green dressiug in young lime cultivations is very advantageous.

The report contains some interesting notes on various plants, cultivated or wild, which may be used as spinach. The section on onion growing, which is of particular interest, was specially referred to in the previous issue of this Journal (p. 91).

With regard to the staple industry of Dominica, the lime crop, calculated in barrels of a capacity of 4·55 cubic feet, amounted to 396,092 barrels for 1917. This is a record output, being 5,000 barrels larger than the previous best crop, that of 1913. In spite of this record, Mr. Jones, the Curator, is not without some apprehension in regard to the future of the lime industry of Dominica, for the reason that the planting of new areas on estates has lessened during the past two years, and also because there is not much activity in this direction amongst peasant proprietors. The remedy, he thinks, is to be obtained by greater efforts on the part of the growers towards greater returns. The area under limes in Dominica, which is estimated at 6,000 acres, ought to be able to produce an annual crop of 600 000 barrels, even at the low rate of 100 barrels per acre, although it is quite possible to obtain a yield of something like 200 barrels per acre. The important section of the report on lime cultivation, and the information obtained at the Experiment Station are given at length on another page of this number. With regard to the exports of lime products, the values of the different forms were as follows: concentrated juice, 149,775 gallons, value £58,366; raw lime juice, 778,133 gallons, value £65,546; raw juice cordial, 469 gallons, value £103; green limes, 41,243 barrels, value £47,734; pickled limes, 350 barrels, value £350; citrate of lime, 1,960 cwt., value £6,669; essential oil of limes, 5,159 gallons, value £17,900; otto of lime, 1,143 gallons, value £8,231, making the total value of the crop of 1917, £204,899 or more than £32,547 over the crop of the preceding year. It may be noticed that the production of lime oils forms a very important item in the value of the crop. If the value of orange oil and bay oil exported be added, the total of the trade in essential oils for 1917 amounted to £28,406.

The report is interesting, and possibly even remarkable, for the general dissertation by Mr. J. Jones concerning the principles underlying the cultivation of limes. These remarks are in a nature of a treatise, embodying an experience extending over a considerable number of years, strengthened by knowledge gained in recent times through the establishment and working of the Lime Experiment Station, by means of which information of much value has already been obtained. This station leads one to reflect that much of the valuable information resulting from its work might have been obtained by lime growers on their own account; and that such results have not been recorded, even if they have been obtained, by individual lime growers, points to the necessity for systematic scientific planting and recording of work. Many attempts have been made to obtain results of this nature by co-operative working with lime growers, and the carrying out of experiments on estates: and while some results have been obtained in this connexion, they are small in comparison with what has been achieved through the medium of a departmental station. Some persuasion was necessary in order to obtain the means of establishing this station; they were not obtained without difficulty, and stress had to be laid on the point that probably it would be possible to derive actual revenue from the work which was projected. Stress had to be laid on possible immediate commercial gains, in order to obtain provision to enable the scientific officers to carry out work which they believed would result in the production of information, which in the near future might be of great value to the lime industry, and which in the more distant future may be the means of securing the lime industry to the colony.

The decline in the export of cacao is very striking, only 3,169 cwt. having been exported during the year, according to the returns of the Customs Department. Comparatively little attention appears now to be given to the cultivation of cacao in the island, and no new plantings are being made to any extent. It would seem as if cacao growing in Dominica is likely to become quite a minor industry.

The report of the Mycologist on the staff of the Imperial Department, dealing with the bracket fungi on lime trees which is included in this report, has already been published in the *Agricultural News*, Vol. XVI, pp. 334 and 350.

A section of the report is devoted by the Curator to a statement of what he feels are the needs of the Department if it is to continue and increase its present useful activities. As the Curator points out, the Department is very under-

stuffed, and many lines of usefulness are impossible to be followed out for this reason. It is quite clear that the present vote for the upkeep of the Department of £1,700, from which must be deducted a total of £602, being receipts from sales of produce raised by the Department, is quite inadequate to he agricultural needs of an island like Dominica. Mr. Jones considers that the Department would require annually a vote of from £2,500 to £2,600 for its adequate maintenance. On the other hand, he believes it certain that if the present lines of development are followed the annual receipts from the cacao and lime cultivations and from the nursery work would yield a return of possibly more than £1,000 per annum, which would only leave a sum of £1,500 to be provided to maintain the Agricultural Department on sound progressive lines.

Another portion of the report deals with the question of establishing Government co operative lime factories. Such a co-operative factory has been found very successful both in St. Lucia and Demerara. The difficulty in the way, however, is that in Dominica the lime industry is already well established, and peasant proprietors are usually able to dispose of their lime crop to neighbouring private factories at a fairly remunerative rate. On the other hand, it is possible that co-operative factories in certain districts would stimulate the planting of limes by the small grower, whereby his position would be strengthened, and he might be enabled to develop his cultivation: this would tend to form a contented and industrious population.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. During the month of February the following plants were distributed: coco-nuts, 148; ornamental, 6; yams, 2,850 lb.; St. Vincent brown-eye peas, 12 lb. 6 oz; onions, 1 lb. 14 oz.; palms, 4 000. Mr. Moore states that the continuation of dry weather is reducing the probability of a fair second picking of cacao forecasted in the previous month. The manufacture of sugar and rum was in full swing. A revised estimate of the area under Sea Island cotton makes the figure 25 acres, while the estimated yield of lint is set down at 1,500 lb. Cacao thrips is reported as in abeyance generally. The cotton ginnery was opened for business. The rainfall recorded at Richmond Hill was 1·90 inches during the month.

NEVIS. During the month of February 60 lb. of cotton seed and 200 onion slips were distributed from the Experiment Station. The young canes throughout the island, says Mr. Howell, the Agricultural Instructor, are suffering much from want of rain, and the germination in some places is very poor. The reaping of the old crop is in progress and, as in previous years, a great part of the crop is being sold to the St. Kitts Factory. Muscovado sugar is being made on nearly all the estates, but the crop is a very short one. The month of March has been proclaimed a close season for cotton, except on a part of the New Road district, where the close season is from April 15 to May 15. The old cotton on the fields is all destroyed, and preparation for next crop in the windward part of the island is almost completed. The work of destroying the native food-plants of the cotton stainers is progressing fairly well; several hundred trees have been destroyed, and the greater part of the island has been gone through. The rainfall for the month, recorded at the Botanic Station, was 1·16 inches.

AGRICULTURE IN BARBADOS.

The weather still continues very dry, and this month has been, up to the present, the driest March experienced for over fifty years.

Even the centre of the island is passing through a trying drought. In St. Joseph's parish, for instance, the total at the 18th instant was just ½ inch, while at this time last year the total for March was 4 inches. In St. Philip, St. Lucy, and Christ Church the situation is of course, worse.

It goes without saying that the young cane crop is not in as satisfactory a condition, generally speaking, as at this time last year. The fields which were planted early are regular, and are bunching fairly well. It is indeed surprising to see how well these fields are resisting the prolonged drought. The fields planted in December and early in January are irregular, and it will be some time before planters can enjoy the sight of a growing plant in each hole. Supplying was being done up to a week ago, but it is now too dry to continue this work. Some of the supplies are making a gallant start, and all depends on the early arrival of general and refreshing showers.

Bit by bit the manuring of the young crop is being completed, but a planter tells us that it will be nearly the the end of the crop before he is through with his work. At this stage, manure is generally spread on the surface, but with the prevailing weather this is avoided.

We have observed that the B.H. 10 (12) has been freely used for supplying this year. The plant from this seedling seems to last longer in the soil than even the Ba6032; it is certainly a more reliable germinator.

Some nurseries for next year have been already planted, and, in spite of the dry weather, we have seen one or two in which many shoots are visible. Some planters do not look with favour on nurseries, and prefer to plant their canes from cuttings from fields, either plants or ratoon, which form a part of the next year's crop. For our part, we like nurseries. The plants obtained from them are generally at a better stage at planting time. There is also the fact that in planting a nursery it is possible to ensure the selection of extra good plants.

The ratoons are spreading with vigour, and attention is being paid to them in the way of weeding and clearing the stumps in general.

In the red soil the B.H.10 (12) as a ratooner is springing more regularly and with a larger number of shoots in each hole than the Ba.6032. If this seedling lasts it will be a boon to the island.

With the advancement of the reaping season there has been a gradual improvement in the quality of the juice, but the tonnage remains stationary.

From one of the factories we learn that the juice this year is purer than last year, and that the amount of sugar per gallon at this date is in excess of the amount yielded in 1918. The B.H.10 (12) has given as high as 2·15 lb. dark crystals to the gallon. The return from this seedling points to a yield of 1 ton of crystals from 6¾ tons of cane.

The drought is hindering the regular start of the fall potatoes recently planted, and this will in all probably shorten the supply of this vegetable during the months of June, July and August. (The Barbados *Agricultural Reporter*, March 22, 1919.)

In reference to the production of guayule rubber, the *India Rubber World*, February 1, 1919, considers that it is perfectly possible that central factories will be installed for its extraction, to which guayule growers will bring in their product just as sugar growers do to sugar centrals.

MARKET REPORTS.

London.—The West India Committee Circular, February 20.

Balata—Venezuelan Block, no quotations; Sheet, no quotations.
Beeswax—No quotations.
Cacao—Trinidad, 90 -; Grenada, 85/-; Jamaica, no quotations.
Copra—£34.
Honey—West Indian, [10/-.
Lime Juice—Raw, no quotations; Concentrated, no quotations.
Pimento—No quotations.
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, February 25, 1919.

Bay Oil—Lower, at 14*s.* to 15*s.*
Lime Oil—Slow, at 5*s.* 6*d.* for West Indian distilled, and 14*s.* for hand-pressed.
Orange Oil—West Indian, 7*s.* 6*d.* per lb.

Barbados.—Messrs. T. S. Garraway & Co., April 1.

Arrowroot—$8·75 per 100 lb.
Cacao—$19·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—No quotations.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—Dark Crystals, $5·50.

Trinidad.—Messrs. Gordon, Grant & Co., March 5.

Cacao—Venezuelan, $18·50 to $21·00; Trinidad, $17·50 to $21·50.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 20c. per lb..
Copra—$4·50 per 100 lb.
Dhal—No quotations.
Onions—$6·00 to $6·50 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $3·00 to $3·50 per 100 lb.
Rice—Yellow, $13·00 to $14·00; White, $9·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs Gillespie Bros & Co., February 25.

Cacao—Caracas, 18c. to 18½c.; Grenada, 17c. to 18c. Trinidad, 18c. to 19c.; Jamaica, 15c. to 15½c.
Coco-nuts—Jamaica selects, $50·00; Trinidad $51·00 culls, $26·00 to $27·00 per M.
Coffee—Jamaica, 16c. to 19c. per lb.
Ginger—16½c. to 19c. per lb.
Goat Skins—Jamaica $1·05; Antigua and Barbados, 90c. to 95c.; St. Thomas and St. Kitts, 90c. to 95c.
Grape Fruit—Jamaica, $3·00 to $3·50.
Limes—Nominal $6·00 to $6·50.
Mace—40c. to 42c. per lb.
Nutmegs—25c. to 26c.
Oranges—$3·00 to $3·25.
Pimento—7½c. to 8c. per lb.
Sugar—Centrifugals, 96°, 6·80c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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	PAGE
Agriculture in Barbados	127
Alcohol, Colonially Produced, British Surtax on	120
Alcohol in Cuba, Production of	117
Ammonium Nitrate as a Fertilizer	121
Back to the Land and Countryside	121
Book Shelf	119
Cassava Experiments in Trinidad	126
Cotton:—	
Sea Island Cotton Market	118
Cotton Ordinance in Turks and Caicos Islands	121
Gleanings	124
Insect Notes:—	
Cacao Thrips in Grenada	122
Poisoning of the Boll Weevil	122
Items of Local Interest	126
Lime Cultivation in Dominica	118
Market Reports	128
Mycology, A Broader	113
Notes and Comments	120
Plant Legislation in St. Lucia, Recent	121
Sea Island Cotton, Improvement in the Yield of	125
Sucrose Content of Canes Crushed	116
Sugar-cane Cultivation in Louisiana, Notes on	115
'West Indian Bulletin', Vol. XVII, No. 3	120
West Indian Products	123

A Broader Mycology.

THE *Kew Bulletin*, No. 10, 1918, records with regret the death of Mr. C. O. Farquharson, Mycologist, Southern Nigeria, who was among the passengers lost at sea through collision on the homeward bound steamer, *Burutu*, on October 3, 1918.

The Bulletin records Mr. Farquharson's keen enthusiasm in his work, the sound judgment with which he confronted its problems, and the excellence of the results he had already achieved in the study of West African agriculture.

A letter sent to the Assistant Director of Kew by Mr. Farquharson, through the mail following the vessel on which Mr. Farquharson sailed is published in the Bulletin referred to above. The letter contains so many ideas pertinent to the trend of thought now engaging the attention of scientific workers who are dealing with the problems of tropical agriculture—ideas having regard to the nature of the work, the methods by which he thought to solve the many difficult problems encountered, and the kind of education that his experience had led him to believe best for workers in this field—that it is of general interest, and worthy of consideration with regard to tropical plant pathology generally.

After expressing his regret at not having written more frequently on mycological matters, Mr. Farquharson gives as a reason that except for rare and brief intervals, he had not really been Mycologist during his whole tour of twenty-three months. His real work had been as Curator in charge of the field labour at Ibadan and Agege. This is a typical instance of the various duties which may devolve on any one of the scientific workers attached to the staff of an undermanned department in tropical countries.

Much of Mr. Farquharson's letter is quoted *ipsissima verba* below. If space would allow, it would be most interesting to give the whole of it. He says:—

'Under the inspiration of my former colleague, Dr. Lamborn, and encouraged by Professor Poulton, I have done little bits of entomology in my leisure, and perhaps know as much about the ways of getting at insect life-histories, and noting their relations to their environment, as any other mycologist in the field, and may be a little more. With some knowledge of handling labour, gained in twenty odd months gang driving of some two hundred men, my education, I think I can consider

fairly wide, and in West African conditions, fairly useful.'

Mr. Farquharson then goes on to pay a tribute to the late Mr. George Massee's economic-mycological outlook, and its influence upon his own work.

In returning to the question of his varied work in Nigeria, he says: 'my experience here, especially being in a position in which I was more or less responsible for getting up crops, or giving a plausible reason for failure, has convinced me that every mycologist ought to be deprived of his microscope (and perhaps even of his pocket lens) for at least the first tour of his service, and perhaps for two years, and compelled to raise *normal* crops with no artificial aids of any sort. If possible also, he should be compelled to study a really representative half-dozen drainage problems, and see them solved by experts. He would greatly benefit by having to dig a few drains himself. I do not pretend to be an expert, but for the first two months of this tour I did dig drains, bits of them, myself, and supervised the digging of an open system, three feet (and even over) deep. I had to do this because I diagnosed asphyxiation to account for defoliation and die-back on some of our cacao here. I had a very bad leave last time, and came back here feeling anything but well. But I saw the water pouring out of a clay subsoil as each spadeful of soil came out, and in due course I saw the cacao trees shoot out leaf-buds everywhere, and that was something.'

He is somewhat sarcastic as to elaborate descriptions of obscure fungi as being the only cause of plant diseases, and concludes as follows:—

'I know there are other causes of die-back in cacao and other trees than lack of drainage. I have had such problems, but I am convinced that all of them can and must be solved without the aid of one-twelfth-inch objectives and Bordeaux mixture.'

Mr. Farquharson is then somewhat sarcastic on the subject of what he calls 'entomogenous fungus boosters', and says that Mr. Massee thoroughly shattered his faith in them because he is quite convinced that very often no attempt is made to find out when a coccid or any other insect dies a natural death not to be attributed to carnivorous fungi. He finishes his remarks by saying: 'Our mycological bug-slayers overlook the normal seasonal periodicity of insects, and it seems to me that not a few have sprayed their fungus-spores just when the insect was about to go anyhow. The seasonal periodicity of insects is extremely well marked here. One day going from my office to my quarters I probably see dozens of "Painted Ladies" (*Pyrameis cardui*). Next day, and for a few months, they are not.

'Early in the rains for two or three days thousands of migrating Libytheine butterflies pass here flying southwards. The negro peasant knows that after that he may safely sow his cereal crops—maize, at any rate. Towards the end of the rains swarms of the same butterflies return northwards. One may conclude that the rains are over. Between the flights to and from the forest belt we never see them. Unquestionably some of our insect pests are only pests when the agriculturist has failed. The agriculturist may not like to be told that. He doesn't object to be told to spray. There is a fine "act of God" feeling about it, so fine indeed that he deosn't even spray, but is satisfied with the belief that it might be done with success. The notorious West African cacao "bark-sapper" (*Salbergella* sp.) in my experience is a pest on the careless agriculturist—a deserved visitation. A leading native grower here sent to the Department by one of our native instructors a collection of insect pests that were vexing him. They were bark-sappers. In the absence of our entomologist these things come my way (though I get no official credit). I sent the instructor to the plantation with a list of questions to answer as to the contour of the farm, soil and subsoil, whether the pest was worst at the top of any slopes on the farm or at the bottom, and if at the bottom, whether the land was swampy. He came back bringing trees (with roots) that he'd dug up. Before he said a word I knew from the stunted, gnarled tap-roots that the trees had grown on the most refractory laterite pan. He told me there was but four inches of soil above the laterite, and that the trees were on the top of a slope. At the bottom, near water, on rich soil, there wasn't a sapper to be seen. I sent word to the owner that if he really wanted to grow cacao on such a place he'd have to dig big holes and deep, and fill them up with compost. He would know himself, from his normal profit margin, whether the expense would justify that method, or whether it would be better to recognize that laterite was no soil for cacao. When next I heard of him he had read my report in a meeting of the Agricultural Society of Ibadan, and denounced my remedy (and me) as impracticable.

'I noticed some time ago in a list of various non-cacao host plants of the bark-sapper, which ought not to be planted near cacao plantations (including Acalypha hedges), that mention is made that though Salbergella is a parasite of Acalypha, which is a hedge at Aburi, yet the cacao there

appears never to suffer from the bug's attention. I am strongly inclined to think the reason is that the Aburi cacao is *cultivated*, and is in a position to keep the sapper at a distance. Thrips of cacao is unquestionably a sequela of misguided agriculture.I hope you will not think I am unduly critical when I say that one's mental outlook may be seriously distorted by only a smattering of things entomological and mycological Some men appear to me to think that because they know a bark-sapper or a root fungus, and can put down their names correctly, that nothing more is to be said than that the trouble has been overcome by Bordeaux mixture, or will probably respond to its application.

. . . . . .

'If I had to map a course for a plant pathologist, I would make a year's residence on a farm compulsory, and make physiology, systematic, and applied (the latter being essentially intensive agriculture and including soil-physics and meteorology) the chief subject. I would bar microscopes till the last year of the training. Every spare hour should be in the field. Field physiology, as opposed to laboratory physiology studied by means of beakers, tubes, and all sorts of ingenious appliances, is a study that wants developing.'

The above remarks of Mr. Farquharson bear out the importance of the comparatively new study known as ecology, which has been well defined as the science of organisms as affected by the factors of their environment. This science, especially as applied to plant life, is being more and more studied. The chief aims of ecology are by means of recorded observations to determine the various phenomena observed, and to draw from the data obtained general principles underlying the reaction of plants to their environmental factors. Mr. Farquharson goes on to describe his own experiences with regard to this matter, which it is intended to reproduce in another number of this Journal.

NOTES ON SUGAR-CANE CULTIVATION IN LOUISIANA.

The *Louisiana Planter*, March 15, 1919, contains the Report of the Committee on Agricultural Progress of the Louisiana Sugar Planters' Association for the year 1918. Much of this report is of great interest and importance to sugar planters elsewhere.

In discussing the question of the maintaince of the fertility of cane soils, the report states that the use of commercial fertilizer not being as popular as in years gone by, planters generally are using soil-building crops and ploughing them under on lands suitable for cane, while they are using their stiff heavy lands for growing hay.

With respect to the value of stable manure, the report remarks that great strides have been made in the proper handling of manure, as planters everywhere realize that this valuable material is capable of saving them many dollars every year. A great many reports speak of the storing of manure for several months before being applied, and then of using a regular spreader—which seems to be giving better satisfaction, and is calling for fewer repair parts—instead of throwaing the manure out at random from a waggon. The construction of stables so that the stock is kept in them, and not allowed to run at large is a most importantitem in this respect.

With reference to the varieties of cane most suitable for Louisiana conditions, it is concluded that two of the Demerara canes are eminently adapted, but for different situations. The concensus of opinion is so much in favour of D.74, that but little can be said of other varieties. Eighty per cent. of those reporting are growing this variety. D.95 continues to be used on new and reclaimed lands. When this variety of cane was introduced into Louisiana by Dr. W C. Stubbs, he especially recomended it to be planted on such lands. On the other hand, much interest was shown in the new seedlings which have been grown at the Sugar Experiment Station. Requests for seed cane of L.511 were unusually heavy. Plant cane of this variety produced 25 tons per acre on a $\frac{1}{4}$-acre plat.

Among the questions respecting the cultivation of the land, the growth of leguminous crops is naturally a prominent one. Cowpeas are being grown and are being ploughed under more generally, and it is likely that the cowpea will soon be used more as a soil-builder than for the purpose of gathering hay. The velvet bean has become a crop in Louisiana. It is being grown on more and more acres, it is being used successfully for hay, and plans for its use as part of a ration for fattening beef cattle are recorded. Some novel ideas are put forward, showing advantageous methods of using velvet beans in conjunction with cowpeas. One is to plant beans in the drill with corn, and later on to sow cowpeas. The cowpea being a more rapid grower, though planted last, covers the ground, keeps down grass, and reaches near maturity before the velvet bean vines climb out on the corn stalks. It is claimed that the plan allows two crops of legumes to be grown in one year. Another plan submitted to secure the same results as outlined above, is to sow a peck of velvet beans and five pecks of cowpeas mixed.

With regard to the care and place of live stock on sugar estates, the report states that the value of live stock in conjunction with sugar-cane has proved itself. This addition to the sugar plantation however, can be an asset in only one way. The raising of live stock must be handled as a branch of the business; success cannot be made of live stock when handled as a mere side line. A live stock man must relieve the plantation manager of all responsibility of such stock for at least the harvest season

The proper way of stabling mules is given attention, and there are some very suggestive ideas put forward. In the matter of housing, the following plan is found to very conducive to securing best results all around. A barn is constructed with stalls for four mules each on either side of a passage way large enough to allow the handling of wagons. This greatly facilitates the work of the stables and of superintendence, and as the stock are kept in and not allowed to roam over a large pasture, the droppings are well kept and conserved. There is also an item in time saved when going to work, as the mules are easily caught, and have water in these stalls. The idea of putting four mules together is got from the use of four mules on many implements and wagons.

ON THE SUCROSE CONTENT OF THE CANES CRUSHED AT THE ANTIGUA AND ST. KITTS CENTRAL SUGAR FACTORIES.

The following paper by Sir Francis Watts, K.C.M.G., Imperial Commissioner of Agriculture for the West Indies, has recently been published in the *West Indian Bulletin*, Vol. XVII, No. 3, and is reproduced as of general interest.

In an article in the *West Indian Bulletin*, Vo'. XVI, pp. 95-103, on the recovery of sugar at Gunthorpes Factory, Antigua, attention is drawn to the fact that the average sucrose content of the canes dealt with has steadily fallen off year by year, but no adequate explanation of the variation was, however, then forthcoming.

The sucrose content of the cane as shown by the yearly averages of all the cane dealt with in each season at Gunthorpes Factory, Antigua, and at Basseterre Factory, St. Kitts, has been as follows:—

Crop.	Antigua.	St. Kitts.
1905	15·3 per cent.	
1906	14·1 „ „	
1907	14·4 „ „	
1908	14·3 „ „	
1909	14·2 „ „	
1910	14·7 „ „	
1911	14·1 „ „	
1912	14·2 „ „	14·6 per cent.
1913	12·9 „ „	13·6 „ „
1914	13·5 „ „	13·5 „ „
1915	12·0 „ „	12·0 „ „
1916	12·5 „ „	12·8 „ „
1917	13·0 „ „	13·4 „ „
1918	13·1 „ „	13·0 „ „

As regards Antigua, where the observations extend over fourteen years, the highest sucrose content was obtained during the first year under record; this is succeeded by a period of seven years during which the sucrose content ranged somewhat over 14 per cent. After this came a period of six years during which the sucrose content fluctuates around 13 per cent., once reaching 13·5 and once falling to 12 per cent.

As is stated in the article in the *West Indian Bulletin* to which reference is made, it was thought that possibly the falling off might be accounted for by the undue prolongation of the grinding season, but an examination of the records, while showing that this has had some influence, leads to the conclusion that the circumstances are not thus fully accounted for, and there is a falling off of the sucrose content of the canes even in the better part of the season. It is possible that in dry seasons the sucrose content of the cane is increased even more than the fibre content, and that in seasons and places of heavy rainfall the canes contain smaller amounts of sucrose; but even here we are faced with the fact that the years 1910,1911,1912 and 1913 were years of trying drought, but of relatively low sucrose in the canes.

These remarks apply to Antigua: it is seen that there is a somewhat similar falling off in St. Kitts.

The year 1915 is somewhat remarkable, in that the sucrose content of the cane both in Antigua and St. Kitts fell to the remarkably low point of 12·0 per cent. It is curious that this should be the case in two separate islands. On referring to records from these islands it is found that the season 1914-15, when these canes were grown, is stated to have been one of deficient and badly distributed rainfall. At Cassada Garden, Antigua, which may be taken as a typical situation in the area from which the factory canes were derived, the rainfall was 33·67 inches from April 1,1914, to March 31, 1915; and it is stated in the reports on the sugar-cane experiments for that year that 'the rainfall was badly distributed; the dry weather experienced during August, September, and October exercised a very adverse influence on the growing crop which had been stimulated to growth by the favouring rains of the early portion of the year. In consequence the yields of canes were low, and the quality of the juice in general, very indifferent.'

In the same report it is stated, as regards St. Kitts, that 'the rainfall was again deficient and badly distributed; as a result the crop produced was short.'

In these circumstances it may be concluded that the abnormally low sucrose content of the canes in 1915 may be accounted for by adverse seasons, but it would not seem that adverse seasons can be regarded as accounting for the progressive falling off of the sucrose content observed in other years.

It was thought that possibly the explanation lay in a steady deterioration of the canes grown in these islands; if this were substantiated, it would be a most disquieting fact, and one calling for active measures to arrest the decline. If there were a general deterioration in the quality of the cane produced, it was argued that this should be shown equally in the canes grown under experimental cultivation on some seven or eight estates in Antigua, and some six in St. Kitts. It is to be observed that these experimental canes are grown on the ordinary fields of the estates, with the estate's cane crop, and subject to the same cultural conditions, and so should, and doubtless do, reflect fairly accurately the general trend of events in their respective districts as regards field crops.

The Annual Reports of the Sugar-cane Experiments in the Leeward Islands record the sucrose content of the juice from the canes grown on the experiment plots. Unfortunately the sucrose content of the actual canes is not recorded, but this has been calculated from the sucrose content of the juice, on the assumption that plant canes contain 15 per cent. of fibre, and ratoon canes 16 per cent. This may not be strictly correct, but it will be near the truth and seeing that a difference of 1 per cent. affects the sucrose content to the extent of about 0·4 per cent., any error so introduced will not seriously affect the deductions which it is now sought to make.

The sucrose content of the canes of three principal varieties largely cultivated in these islands, namely White Transparent, Sealy Seedling, and B. 147, both as plants and ratoons, has been calculated from the averages of the several plots annually reaped in each of the islands, and also of the canes dealt with at the two central factories. The three varieties selected comprise by far the greater part of the canes dealt with at these factories.

From the tables given in the original article, but not here reproduced, it is noticeable that, while there is fluctuation in the case of the sucrose contents of these three canes, this fluctuation does not trend downwards, as is the case with the figures relating to the factory canes. It is somewhat curious that in all three varieties of canes, and in thefactory canes at Antigua as well as St. Kitts, a remarkably low sucrose content is common to all in the season 1915. This feature has already been discussed in connexion with the factory canes, and it is believed to be due to the peculiar climatic conditions of that season.

If the sucrose contents ot the canes in 1915 are eliminated, it is seen that the figures relating to the sucrose contents of the other canes fluctuate around a mean, and that the sucrose contents of later years are as high as those of the earlier years, being thus in marked contrast to the sucrose contents of the factory canes whether at Antigna or St. Kitts, which have steadily deteriorated. It is reasonably to conclude,

therefore, that there has been no specific deterioration in the quality of the canes ordinarily grown, that is to say, there has been no specific deterioration in the varieties cultivated, while there has been deterioration in the quality of the canes delivered to the factories.

It is suggested that this deterioration of the factory canes may be due to two or three causes. It is not improbable that the canes have not been cut in the manner that was customary when the crops were reaped for the purpose of making muscovado sugar; in that case, care was taken to exclude the unripe, upper portions of the cane. Under factory conditions, where the principal consideration of the cutter and seller is that of weight, it is not unlikely that these unripe portions are not excluded; they weigh well, and therefore there may be a strong tendency to include them.

Again, in the efforts to get as much cane as possible for the factories, it may be that fields of inferior, stunted canes have been reaped, thus lowering the average sucrose content.

It is also suggested that some deterioration may take place from canes being kept for some considerable time after cutting, before they are crushed, a condition which has been accentuated by difficult labour conditions.

There may be other causes at work; but with this analysis of the situation, it would seem that these causes must be sought by the managers of the factories and by the planters themselves; the material passes through their hands, and they alone have the means of accumulating the data necessary for further discussion. The matter is hardly one concerning which official records or investigations are calculated to throw much further light unaided by those concerned with the factories and estates.

The first named cause of deterioration in quality, namely the cutting of the cane in a manner different from what was formerly the case, but which would persist in the cutting of the experimental canes, most probably accounts for the difference. If this is so, the sellers of cane have been able to increase the weight of the cane delivered, at the expense of the quality. This tendency to a modification of the manner of cutting the canes, when transferring from a muscovado to a factory basis, is one which must be looked for and taken account of when such changes are contemplated, for it would seem that there is a possibility of a depreciation in quality setting in to an extent of 1 in about 14 of sucrose, that is about 7 per cent. of the total value of the cane. It may be a matter for argument whether it is economically sound to cut the canes with the less ripe portion attached so as to avoid wasting such sugar as it may contain; but it is quite clear that it alters the basis of valuation of canes so dealt with.

Mr. G. Moody Stuart, the Managing Director of Gunthorpes Factory, Antigua, Basseterre Factory, St. Kitts, and Ste. Madeleine Factory, Trinidad, commenting on these notes, says: 'I had been feeling anxious myself for some years, but I thought the cause was probably that we had got into a cycle of poor seasons, and that we might hope to get out of it again. In my opinion one ought to eliminate the year 1915 entirely from any review of this matter, for, as you would see from our Ste. Madeleine Annual Report of that season, the unusually low yield of sugar was a common feature throughout the West Indies in that year; that the Cuban and Porto Rico factories had taken one or two tons more cane to make a ton of sugar than in any season since the introduction of modern machinery, and this was apparently due to the absence of cool nights, which are required during crop time for the ripening of the cane. But when 1915 has been eliminated, there still remains a great deal to be accounted for and cured.

'We have been watching the point of the better trimming of canes for several years, and in the last two years at least it is stated that the canes in Antigua have been delivered much freer from tops than before, and in the St. Kitts report for crop 1916, you will see that we remarked there 'that the canes were better cleaned and trimmed than previously.'

A later communication from Mr. Stuart states that Mr. La Salle, the Chemist of Gunthorpes Factory, Antigua, feels fairly sure that the deterioration in the sucrose and purity of the canes as ground in that factory, which has been going on from year to year, arises mainly, and very likely entirely, from the staleness of the cane, except in two seasons when there was an unusual amount of stand over cane which would account for part of the deterioration.

THE PRODUCTION OF ALCOHOL IN CUBA.

An article in the *Weekly Bulletin of the Department of Trade and Commerce*, Canada, February 10, 1919, draws attention to the great development in the production of alcohol in Cuba. Most of this article is reproduced below, as the subject is of importance in all sugar-cane growing countries.

Although Cuba up to the present time is not a very large producer of alcohol, yet there is a great opportunity for the country to attain a leading position in the manufacture of alcohol, because of the large production of sugar. From the manufacture of a ton of sugar 40 gallons of molasses (or 'miel' as it is called) result, and from this 40 gallons of molasses 16 gallons of alcohol of the first quality can be produced. The estimated production of sugar on the island for the present season is 4,000,000 tons. The amount of molasses that would result from the manufacture of this quantity of sugar would be 160,000,000 gallons, which would produce 64,000,000 gallons of alcohol. It is claimed that in the process of manufacturing this 160,000,000 gallons of molasses into alcohol, 18,800 tons of potash and 4,800 tons of nitrogen can be extracted. Efforts are now being made to establish ten plants, situated at convenient locations on the island, fitted with the latest improved machinery for the manufacture of alcohol. It is estimated that these ten factories can be built with sufficient capacity to handle all the molasses produced in the island at a total cost of $2,500,000 or $250,000 for each factory. Great quantities of this molasses are shipped to the United States and other countries in tank steamers and tank cars, and, before the war, sold as low as 2c. a gallon, but during the war has been sold as high as 10c. a gallon.

If the total estimated production for the season of 160,000,000 gallons of molasses was sold at prices prevailing at the beginning of the war, say, 4c. a gallon, it would bring $6,400,000. If this 160,000,000 gallons of molasses were made into alcohol, and the chemicals extracted and sold at prices that prevailed before the war, the result would be as follows, showing a gain of over $10,000,000 over the present system of selling the molasses as it comes from the sugar mills:—

64,000,000 gallons of alcohol at 20c.	$12,800,000
18,800 tons of potash	2,068,000
4,800 tons of nitrogen	1,920,000
	$816,788,000

There are several establishments now on the island manufacturing alcohol from molasses, and after supplying the local demand a considerable quantity is exported.

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended March 22, 1918, is as follows:—

ISLANDS. The market has been very quiet throughout the week, the sales reported consisting entirely of cotton more or less off in preparation. Although the factors are desirous of selling, and are generally holding for previous prices, yet with orders in hand we think we could buy from them at some concession, especially so as the United States Census Bureau reports nearly 10,000 bales ginned, making the crop 1,000 bales larger than previously estimated.

We quote, viz.:—

Fine to Fully Fine, @ 52c. to 53c., f.o.b. and freight.
Fine to Fully Fine, slightly off in preparation, @ 50c. to 51c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. There has been a good demand resulting in sales of 996 bales, taking all grades, the better grades being scarce, on a basis of Extra Choice 49c. to 49½c., f.o.b., and freight, the buying being on account of the Northern Mills. A percentage of the cotton sold consisted of old crop cotton, which did not average Extra Choice.

We quote, viz.:—

Extra Choice 51½c., f.o.b. and freight.
Basis Extra Choice, including all grades, 49½c, f.o.b. and freight.
Choice 48½c., f.o.b. and freight.
Extra Fine 47½c., f.o.b. and freight.

The exports from Savannah for the week were: to Northern Mills 306 bales, and from Jacksonville to Northern Mills 192 bales.

On March 20, the United States Census Bureau made its final report of cotton ginned to March 1, as follows:—

South Carolina	9,964 bales	making a total of 51,389 bales.	
Georgia	21,265 bales		
Florida	20,160 bales		
against last year,	92,501 bales.	Total crop	88,174 bales.
,, 1917	117,544 bales.	,, ,,	113,109 bales.
,, 1916	91,920 bales.	,, ,,	85,278 bales.
,, 1915	81,598 bales.	,, ,,	78,857 bales.

LIME CULTIVATION IN DOMINICA.

II. MANURING, MULCHING, AND GREEN DRESSING.

(*Continued.*)

The following is a continuation of Mr. J. Jones's report of results obtained by him at the Experiment Station, Dominica, the first part of which appeared in the previous issue of this Journal:—

Manuring. Very little had been done in the work of systematically manuring lime fields, and in recording the yields, until the experiment plots were started. Here again interruption occurred, as, owing to the hurricanes of two successive seasons, the experiments had to be recast and restarted. But in the four years' record the results obtained were highly instructive to planters, because what was accomplished by cultivation and manuring in the case of old and neglected trees at the experiment station is also possible on estates.

There can be no doubt that the leading factors in successful plantation work are shelter from wind, draining, and manuring; the last named is placed third, for the reason that the best results cannot be obtained if the trees are exposed to the wind, and the fields remain undrained. Trees requiring shelter cannot make the best use of manures, whilst in the case of undrained fields the soil is not in a properly aerated condition so as to give the best results, and a loss of concentrated nitrogenous manure is possible owing to surface wash. Therefore each factor should receive careful attention in order to secure maximum results.

The main manurial experiments now carried on consist of five plots, three times repeated, one series with old limes, and two series with young limes. They are as follows:—

A. Complete manure of nitrogen, phosphates, and potash.
B. Control. No manure.
C. Mulch of grass—5 tons per acre.
D. Nitrogen and phosphates.
E. Nitrogen and potash.

There is also a single plot which receives nitrogen alone, but it is not possible at present to add check plots to this.

Another matter of great importance, on which information is wanted, is in regard to the right time of the year to apply concentrated nitrogenous manures in lime fields. A practice has sprung up amongst planters of applying these quick acting manures at the close of the season, that is about November-December. In the Agricultural Department these particular manures are always applied to the plots with the early rains in April-May. Justification for this action is sought in the fact that it is the spring time of the year, that the trees are waking up after their resting period—the dry season, that from April onwards the days are lengthening, that the daily average of sunshine is increasing, and that the temperature of both air and soil is rising. From May to September is the period of maximum vitality of plant life, in which lime trees are able to take up and make the best use of available plant food.

To apply quick-acting manures in November-December, when the reverse conditions to those mentioned are being felt, does not appear altogether sound. The time of application may be a cause, amongst several possible ones, which leads some planters to assert that very poor results, or none, have followed the application of these manures at that period of the year. In the Experiment Station the effects of every application of quick-acting nitrogenous manure are apparent, but further experiments are needed to settle this important point beyond doubt. Possibly, considerable losses are being sustained yearly owing to want of information on this matter.

It is probable that the time of application of phosphatic manures is not so important as in the case of nitrogenous manures, but preferably these should be applied between January and May. In the matter of the application of pen manures, this is largely a question of estate convenience. Regarding mulches, these should, whenever possible, be applied early in the year, so as to afford a covering to the soil during the dry season, together with availability as plant food during the following wet and growing season.

Mulching. The mulching of both lime and cacao plots has been recommended for a long time as a means of maintaining the humus content of the soil, without which the trees soon fall into a poor condition. In Dominica this can be done by the application of pen manures, by cutting off the tops of native bush and carrying the material on to the plantation, by the use of dead leaves of deciduous trees, by collecting

accumulations of organic matter in drains and their outlets, and by growing special plants in odd corners of the estates for the purpose of supplying mulches.

In estate practice in Dominica it is held by planters that the cutting and carrying of green mulches of native bush, and the collection of dry material under deciduous trees is much too expensive a method of soil improvement, It is, however, somewhat difficult to accept this, unless the material is carried over long distances, a proceeding which is not recommended. It cannot and should not be as expensive as the cost of producing pen manure. Probably the real difficulty lies in the fact that the average planter has rightly a great belief in the efficacy of pen manure, therefore the expenditure in this case is considered justifiable. In the matter of mulches, either green or dry, of native plants, there is a doubt as to the utility of the work in the minds of some owners and managers, which makes all efforts and expenditure in applying them appear unnecessary and large, in view of the already held opinion that all work in this direction is of questionable value.

In the Experiment Station, in which there is little in the way of native bush to draw upon, it has been necessary, in order to secure material for the mulched plots, to plant up odd corners with lemon grass and *Gliricidia maculata* for this purpose. These areas lie close to the plots; therefore the cost of carrying on the mulch is reduced to a minimum. Later on it is hoped to measure the areas which produce mulch, and calculate the annual yield of this material. It will then be possible to state the amount of land required to be set aside for each acre of lime cultivation on a 5-ton requirement of mulch per acre per year. The supply of mulching material may be solved on some estates along these lines.

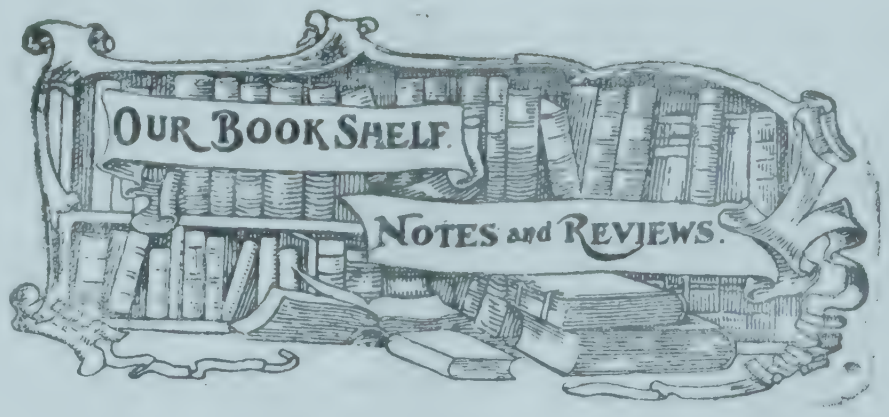
In Dominica, owing to the broken nature of the country, there are no large stretches of cultivation. The estimated acreage under limes (6,000 acres) is made up of numerous small areas. The majority of these are surrounded by native vegetation which, if utilized, should maintain the fertility of cultivated lands at a high standard. On a few large estates, on which the difficulty of obtaining material is obvious, a good deal might be done to improve the situation by planting the banks of rivers and streams, edges of ravines, and lands too steep for lime cultivation, with plants suitable as mulch producers.

It is a fortunate thing for the lime industry that a considerable portion of the cultivation which lies on slopes at the foot of cliffs, receives from the vegetation which clothes the rocks above, a large amount of valuable material yearly. This, however, is seldom enough, and even in such favoured localities, applications of mulch would prove helpful. In open fields, which have no such natural sources of supplies, this form of manuring is necessary if the trees are to be maintained in good health. This work of mulching should be additional to the use of all the pen manure that can be produced and applied on the estate.

Green dressing. The uses of such plants as the horse bean (*Canavalia ensiformis*) as a ground cover, and of *Tephrosia candida*, both as a ground cover and for affording lateral shelter to young limes for a period of two years or more, have been demonstrated at the Experiment Station, in which place they have proved of high value. The functions of the plants as soil enrichers have also been explained to planters.

As a result of the experiments there is now a considerable demand for seeds of the horse bean and of Tephrosia for growing in young cultivations. It is hoped that the use of these nurse and cover plants will continue to increase.

(*To be continued.*)



EQUIPMENT FOR THE FARM AND FARM, STEAD. By Harry C. Ramsower. Professor of Agricultural Engineering in the College of Agriculture of the Ohio State University: pp. xii + 523. *Ginn & Co., New York. London, etc.* Price $3·00.

It is only in recent years that questions, such as those discussed in the book under review, with regard to the general problems of agricultural equipment have been given scientific consideration. This book brings together and presents in a very readable form facts and principles underlying the successful equipment for any agricultural holding. Primarily it is addressed to the farmers of Ohio, but it is worth while being placed on the book shelf of any agriculturist who is seeking information for the solution of problems which daily crop up in agricultural practice.

The first two chapters discuss and explain some general principles of mechanics and the transmission of power, which are so clearly explained that anyone with the smallest knowledge of mathematics will not only be interested in their discussion, but will be able easily to apply the principles practically.

The next two chapters discuss materials of construction with regard to the various purposes for which they may be required. The discussion of cement and concrete and their uses is particularly full.

The next section, if we may call it so, of four chapters, is concerned with the laying out of the farm, its fencing, and the construction of the buildings thereon, from the living house to the poultry house

Chapter IX deals in detail with the lighting of the farm home. In this chapter the various methods of possible illumination are discussed and explained in an interesting way, from the kerosene lamp to electric installation.

The next seven chapters discuss machinery for the development of the water-supply of a farm, while another chapter explains very fully the requisite plans for the disposal of sewage.

The largest section of the book consists of ten chapters on farm tools and machinery, the first of these chapters being devoted to the basic tillage tool, the plough.

The chapter on gasolene and oil engines is full of most valuable information and explanation as to the construction and employment of these modern, but now indispensible, adjuncts to high class farming.

The last chapter of the book, on rope and its uses, will be, to a general reader, one of the most charming of this charming book. It would seem that no possible knot, hitch, or splice which can be constructed with a bit of rope is omitted from the various lucid explanations.

Not the least pleasurable features of the book are the clearness of the type and the very numerous illustrations. It is, in fact, so copiously illustrated that one can hardly think that there is a possible illustration omitted. This book is to be most heartily recommended for the use of agriculturists anywhere.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial deals with the advisability of a wide outlook in matters relating to plant pathology.

The first article under Insect Notes, on page 122, is the abstract of a report by the Entomologist on the staff of this Department on cacao thrips in Grenada. The work done with respect to poisoning of the boll weevil in the United States is discussed in a second article.

On page 118 will be found a continuation of the article on lime cultivation in Dominica, the first part of which appeared in the previous issue of this Journal.

The 'West Indian Bnlletin', Vol. XVII, No. 3.

This number of the *West Indian Bulletin*, which has just been issued, contains several articles of considerable interest. The first, reproduced from the *Journal of Industrial and Engineering Chemistry*, is an account by Dr. Charles E. Coates of the working and aims of the famous Aububon Sugar School in Louisiana. It is well worth careful consideration, showing as it does that the provision for high class scientific training in any direction requires most careful planning beforehand, if satisfactory results are to be attained.

Swine fever has attracted considerable attention recently in the West Indies. Owing to the fact that there is some confusion between several forms of swine diseases, and some differences of opinion as to methods of treatment, information of the most reliable character on the these points will be found in the second article of the Bulletin by Professor Sir John McFadyean, Principal of the Royal Veterinary College in London. This article is reprinted from the *Journal of the Royal Agricultural Society of England.*

The third and fourth papers relate to certain conclusions from some recent researches by Mr. S. C. Harland, B.Sc., Assistant for cotton research on the staff of the Imperial Department of Agriculture for the West Indies. Further reference to one of these papers will be found on another page of this Journal.

An address delivered to the St. Vincent Agricultural and Commercial Society, October 1918, by Sir Francis Watts, K.C.M.G., Imperial Commissioner of Agriculture for the West Indies, concerning cotton in St. Vincent, and the steps which must be taken to safeguard the industry, is reproduced as the next article.

Two short but important papers follow on a new nematode, causing a disease of bananas and its identification. The first by Mr. W. Nowell, D.I.C., Mycologist on the staff of the Imperial Department of Agriculture, describes the appearance and effects of this disease. Most of this has already appeared in the *Agricultural News*, Vol. XVII, No. 422. The second paper referred to is an identification of the nematode by Dr. N. A. Cobb, Agricultural Technologist, Department of Agriculture, United States of America.

The final paper of the number, suggesting the causes of the decreased sucrose content of canes crushed at the central factories in Antigua and St. Kitts, by the Imperial Commissioner of Agriculture, will be found reproduced on another page of this issue.

The British Surtax on Colonially Produced Alcohol.

In the previous issue of this Journal, the certainty of the largely increased demand for industrial alcohol for motor purposes in the United Kingdom was pointed out.

In the *West India Committee Circular*, March 20, 1919, there is an article which draws attention to the handicap placed on colonially produced alcohol by the surtax imposed on it in the United Kingdom. Spirits manufactured in the United Kingdom, for

'methylation or for use in art and manufacture,' are duty free. Colonially produced spirits, on the other hand, if imported for a similar purpose, would have to pay the surtax of 4*d.* per gallon, which is an extra duty imposed on colonial and foreign spirits, with the object of compensating British distillers for various disabilities to which they claim to be subject owing to excise restriction.

It must be remembered, however, that producers of spirits in the West Indies are also subject to similar disabilities, which are, like those in the United Kingdom, under the control, though indirectly, of the British Government, and that therefore, while there may be justification for the imposition of a surtax on foreign spirits, the question is quite different with regard to industrial alcohol produced in the colonies, such as the West Indies. The matter is an important one at the present time, in view of the quantities of Cuban rum which are now being produced, as is noticed on another page of this issue.

Now that the United States are definitely committed to prohibition, other markets will have to be found for Cuban rum, and unless steps are taken to prevent it, th emarkets of the United Kingdom will be flooded with alcohol from Cuba or other foreign places, with detriment to the product of Jamagn and Demerara.

Ammonium Nitrate as a Fertilizer.

Since hostilities have ceased, the Ministry of Munitions has been able to liberate large quantities of ammonium nitrate for the purpose of agriculture. Dr. E. J. Russell, the Director of the Rothamsted Experimental Station gives an account in the *Journal of the Board of Agriculture*, February 1919, of the results of field trials and other investigations to discover what value the material possessed as a fertilizer. The results were successful, and showed that ammonium nitrate is by far the most concentrated nitrogenous fertilizer on the market.

The general results of the Rothamsted experiment are summarized as follows:—

(1) Ammonium nitrate is an excellent fertilizer, the nitrogen of which is worth as much as that in nitrate of soda and sulphate of ammonia. At present prices of these two fertilizers, ammonium nitrate would, on the same basis, be worth £37 5*s.* per ton.

(2) It contains more than twice as much nitrogen as nitrate of soda, and one and three quarter times as much as sulphate of ammonia. Where 3 cwt. of nitrate of soda or $\frac{3}{4}$ cwt. of sulphate of ammonia is ordinarily used, less than $\frac{1}{2}$-cwt. of nitrate of ammonia would be required.

(3) It can be applied to any crop for which nitrate of soda is suitable. Its proper use is as a top dressing, and not as a constituent in mixed manures.

(4) Farmers must insist on having the non-deliquescent variety, otherwise they will certainly be inviting trouble.

(5) While the material itself is not inflammable, it yet helps a fire considerably. Great care is therefore necessary not to store it under conditions where a fire might be started.

Cotton Ordinance in Turks and Caicos Islands.

An Ordinance dated December 28, 1917, has recently been fowarded to the Imperial Commissioner of Agriculture by Mr. G. Whitfield Smith, the Commissioner of the Turks and Caicos Islands. The Ordinance has been passed for the protection of small growers of cotton from unfair prices owing to their production of only inconsiderable amounts of seed-cotton. After providing for the issue of licenses to buyers of cotton, the Ordinance makes it a penal offence for any person, even if so licensed, to purchase cotton of a less amount than 500 lb. in weight. No such small amounts may be privately purchased. They must all be dealt with by the Government ginnery.

Back to the Land and Countryside.

Information has been received by the Imperial Commissioner of Agriculture that it is intended to hold at the Royal Botanic Gardens, London, during the months of July, August, and September 1919, a 'Back to the Land and Countryside' Exhibition and Conference.

The aims and objects of this 'conference and exhibition' are, amongst others, as follows: (1) to interest and educate the public generally in all matters connected with agriculture and horticulture; (2) to show by actual demonstration what a small land holding is, and how it can be worked to the best advantage; (3) to help forward the question of rural housing, and to show actual models of rural houses and cottages; (4) to encourage fruit planting and forestry; (5) to show under one roof and at one time the latest appliances used in agriculture and horticulture; (6) to help and encourage emigration, and to show the products from overseas and the methods of obtaining the same. In view of the national importance at the present time of these and like matters, and the necessity of showing those who contemplate taking up a small holding exactly what it means, and how arduous the work is, and with a view to encouraging only those who are fitted by physique and training to achieve success, this conference and exhibition is likely to prove of considerable use.

Recent Plant Legislation in St. Lucia.

In the last issue of this Journal Government Proclamations forbidding the importation of citrus plants from certain places, and growing coco-nuts from certain others into Antigua, and the reasons therefor were noted.

The Administrator of St. Lucia has forwarded to the Imperial Commissioner of Agriculture copies of similar Proclamations recently issued in that Colony.

The clear notes placed at the foot of each copy of the Proclamations in St. Lucia, giving the reasons for the prohibition of importation in these cases, is a feature worthy of being widely imitated in similar cases. Both of the Proclamations in St. Lucia are dated February 25, 1919. It may be noticed that former Proclamations with regard to the importation of citrus plants from the United States and other places, and also of coco-nuts from Trinidad and other places, are still in force in St. Lucia.

INSECT NOTES.

CACAO THRIPS IN GRENADA.

The subject of cacao thrips in the West Indies has frequently been referred to in the *Agricutural News*. The present article has reference to a report by the Entomologist on the staff of the Imperial Department on a visit to Grenada for the purpose of studying cacao thrips in that colony in January last.

It appears that cacao thrips has now been recorded in every parish in Grenada, and that at one time or another these attacks have been serious in each parish. There appears to be no immunity to thrips in any locality in the island. The occurrence of thrips in epidemic form has consistently been held by this Department to be associated with some conditions unfavourable to the cacao trees, and it has been held that the control of thrips depended on the improvement of these conditions rather than on direct attacks on the thrips themselves. Present conditions in Grenada seem to bear this out. Planters have been able to reduce the attacks of thrips, and even to control them satisfactorily by the application of such agricultural methods as draining, mulching, and manuring.

As a result of the visit of Mr. Urich to Grenada in 1917, several planters are spraying for the control of thrips. The insecticide largely used is that form of Nicotine sulphate known as 'Black Leaf 40', applied in conjunction with Bordeaux mixture, and, in some instances, with soap. Black Leaf 40 used by itself does not spread well. The Bordeaux mixture combines the functions of a fungicide and spreader, while the soap, in those cases where it is used, is a spreader only.

Mr. Urich's visit to Grenada to advise in the matter of cacao thrips control was the outcome of representations made in 1916 to His Excellency the Governor to the effect that the cacao thrips was more abundant than usual, and constituted a threat to the success of the industry. How far this belief was justified may be judged from the fact that the crop of 1916 was the largest crop which has ever been produced in Grenada being some 27 per cent. larger than that of the preceding year. The crop of 1917 was even larger than its predecessor.

The occurrence of thrips in epidemic attacks is frequently associated with the lack of drainage, but it is also to be noticed that any unfavourable conditions such as shallow soil, with a hard and impenetrable subsoil underlying it, the occurrence of root disease and canker, and the exposure of the soil to the direct rays of the sun are all liable to be accompanied or followed by thrips attack. As the result of these conditions or diseases, it is believed that some change takes place in the cacao plant which makes it less resistant to the cacao thrips, or possibly this may better be stated as follows: the upset in the physiological condition of the cacao plant which follows as a direct result of root asphyxiation resulting from bad drainage or from root interference, and such diseased conditions as already mentioned, produces changes which make the plant tissues more attractive to thrips and more favourable to their breeding and feeding. This is often to be seen in adjoining trees, one of which being perfectly healthy carries a limited number of thrips without being 'attacked', while another, being unhealthy, is seriously attacked.

Shade or the lack of shade appears to have a bearing on the thrips situation. On wet soils, deep rooted shade trees assist in drainage, and in this way tend to improve the soil conditions. There does not seem however to be necessity for shade as a protection to the foliage of the cacao tree, but shade as a soil cover appears to be most important. Exposure of the soil to the sun, and particularly to the afternoon sun, seems to be very detrimental to the cacao tree and conducive to thrips attack. Exposure to winds seems to be associated with thrips attack.

The beneficial effects of improvement of cacao fields by drainage and mulching continue to be evident. The following suggestion, which is put forward in the report as offering a subject for trial, is of interest. In many places where there is an excess of moisture, and a particularly difficult subsoil to be dealt with, it is to be noted that even with an abundance of drains something still needs to be done. The increased number of drains cuts the land up into small patches carrying a few trees each, and every time the drains are opened additional quantities of subsoil, quite useless for plant roots, are brought to the top, The question is raised whether a certain proportion of these drains might not be filled in and made to serve a double purpose. If a drain were taken and thoroughly cleaned, its bottom being reduced to a smooth gradient capable of carrying water easily, and then filled with leaves, pods, bush, and any organic matter, would it not continue to function as a drain, and at the same time enormously increase the available feeding space and food material for the cacao roots!

Reference is made to the use of manure and lime, but particular stress is laid on the value of drainage, and the use of large quantities of organic matter as mulch. An adaptation of the filling in of certain drains appears to be worthy of extended consideration. The ordinary pits dug for 'bedding in' pods and leaves are without drainage On certain estates these are dug on sloping land in the form of a trench, the bottom of which, properly graded, runs out to the surface, or communicates with a drain. The trenches which are filled in, although they would continue to function as drains, would best be considered as trenches, probably 'feeding trenches', in order to emphasize the fact that a very important function of such trenches is to supply large quantities of food material and additional root space.

THE POISONING OF THE BOLL WEEVIL.

In a recent number of the *Agricultural News* reference was made to the success which attended some experiments in the control of Mexican boll weevil by the application of poison. Information has lately been received by the Imperial Commissioner with regard to more recent trials on a large scale in the use of poisons.

'During the season of 1918 the attempt was made to control the weevil successfully on some 35,000 acres of cotton. On the whole, the results were very satisfactory indeed, and demonstrated quite definitely the practicability of utilizing this method of control on a plantation basis. However, there is still much to be worked out before final and definite instructions for general use can be given, and it will be noted that the instructions in the following pages are rather conditional in many ways, but these are made as definite as is possible in the present status of our information.'

The preceding paragraph is quoted from a circular letter from the United States Department of Agriculture Bureau of Entomology, issued by the Delta Laboratory for the study of Southern Field Crop Insect Investigations.

At the present time the work of poisoning for control of boll weevil is most encouraged in the fertile soils where the greatest weevil damage is experienced, and where the possible crop is highest. The machinery to be utilized in weevil poisoning work may be divided into two classes: the large power dusters, and small hand dusters or powder guns. These machines are on the market, and as manufactured at present are capable of doing very good work, but this class of machinery is not yet perfect, and it is likely that further improvements will be made.

The poison found useful in this work is a calcium arsenate conforming to the following specifications:—

Not less than 40 per cent. arsenic pentoxide.
Not more than 0·75 per cent. water soluble arsenic.
Density not less than 80 cubic inches per lb.

This poison is applied in the form of a dust, and the machines mentioned above are dusting machines. It is suggested that about 6 lb. per acre will be required for each application, and the number of applications during the cotton season will be from two to four, but in most cases large cotton growers will not find it necessary to spray their entire acreage each time. In case of a heavy rain within twenty-four hours after an application it should be repeated.

It appears that the time of day for application is quite important, the application being far more effective if made when the air is calm and the plants are moist, which means between 4 or 5 in the afternoon and 8 or 9 in the morning.

The power duster mentioned above is designed to cover five rows at a time, and it is expected that such a machine would average at least 6 acres per hour. The hand dusters are capable of doing about 5 acres each per day, working three or four hours early in the morning and two or three in the late afternoon. 'The guns are decidely tiresome to use, and it is not likely that a labourer will be able to work one much more than this length of time during the day. For this reason a maximum of 20 to 25 acres per week is about all that could be expected of a single hand dust gun.'

The foregoing notes have been abstracted from the Circular letter mentioned above, which was issued, March 8, 1919, for the purpose of putting forward information that had been accumulated more quickly than it could be done in printed form

The machinery referred to is manufactured by the following companies. The power machine known as the 'Weevil Duster' is built by the Dust Sprayer Manufacturing Company, 1222-4 West 9th Street, Kansas City, Missouri, and two hand guns, the 'Monarch' manufactured by the Tow-Lemons Manufacturiug Company, Springfield, Tennessee, and the 'Springfield' manufactured by the Springfield Dry Powder Sprayer Company, also of Springfield, Tennessee.

A very large amount of work in connexion with the cotton boll weevil and its control has been carried out in the United States since the introduction of that insect some twenty-five years ago. After extensive trials it was decided that this insect was not susceptible to control by poisoning, but now it appears as if the use of poison was giving satisfactory results. It will be of interest to cotton growers in the West Indies to follow this line of work in the United States. The Mexican boll weevil does not occur in these West Indian islands but the work being done in connexion with the application of dry insecticides by means of power dusters and hand guns, and the use of arsenate of calcium as a poison on cotton plants may furnish information which will later have a bearing on the control of our local pests.

H.A.B.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of February 1919:—

The disturbed condition of the labour market which has been much accentuated since our last report, has had, if not a direct effect on any product coming under our notice, certainly a general effect on the ordinary means of transit of goods over and above that of personal travelling. In short, the strike fever which at one time threatened a complete collapse of trade has given a serious shock to all branches of commerce, in consequence of which our present report for the month of February will be somewhat meagre.

LIME OIL, PIMENTO OIL, PIMENTO, GINGER, NUTMEGS, AND MACE

At the first auction on the 6th of the month there was a general absence of interest in West Indian produce; lime oil, and pimento oil were quoted at lower rates, distilled pimento being offered at 15*s.* 6*d.* per lb. At auction on the 13th pimento (berries) were offered at 4*d.* per lb., but some sales were made at 3½*d.* At auction on the 20th, however, pimento was firm at 4*d.* per lb., at which price it remained at the end of the month. Ginger has been in good supply and in fair demand. At the beginning of the month Sierra Leone was quoted at 45*s.* per cwt., and some sea-damaged Japanese fetched from 27*s.* to 32*s.* 6*d.* A week later there was a quiet market at the following rates: Jamaica 120*s.* to 140*s.* per cwt., washed rough Cochin 95*s.* to 100*s.*, rough Calicut 85*s.*, Japanese 65*s.*, and Sierra Leone 75*s.* At the last auction on the 27th of the month some 500 odd bags of Japanese were offered without reserve, and disposed of at the following rates: 35*s.* to 37*s.* 6*d.* per cwt. for fair small. At the last auction on the 27th of the month as many as 1,156 packages of West Indian nutmegs were offered, 600 of which were sold at advanced rates, though the consignment was for the most part of poor quality. Mace was also in good supply at this sale, 677 packages of West Indian being offered, most of which sold at advanced prices on previous rates.

SARSAPARILLA.

This drug was in very full display at auction on the 13th of the month, being represented by 89 packages of grey Jamaica, 55 of native Jamaica, 17 of Lima-Jamaica, and 10 of Mexican. Only 6 bales of the first were sold at 2*s.* 9*d.* per lb., part mouldy; and of the native Jamaica, only 1 bale found a purchaser. No sales were effected for either the Lima-Jamaica or the Mexican.

CITRIC ACID, KOLA, AND ARROWROOT.

At the beginning of the month there was a quiet demand for citric acid at 4*s.* 6*d.* per lb., but later on it rose to 4*s.* 7*d.*, at which price it remanied firm at the close. Kola was in full supply at auction on the 13th of the month, being represented by 170 packages, but no sales were effected. At the close of the month however, some 30 odd bags of fair dried Grenada were offered, and 20 sold at from 5*d.* to 6*d.* per lb. At the end of the month fair manufacturing St. Vincent arrowroot was quoted at 9 per lb.

GLEANINGS.

The *Louisiana Planter* for March 8, 1919, states that the imports of sugar into the United States for the twelve months ended December 31, 1918, reached 2,585,500 short tons, valued at $242,265,430. These imports were about $20,000,000 more in value than for the previous year, and about $114,000 tons less in quantity.

Argentina as a sugar producer stands third in its production among South American countries. Brazil produces more than 300,000 tons, Peru produces about 250,000 long tons annually, and Argentina about 150,000 tons. The next country of moment is British Guiana, which has recently exported about 100,000 tons. (The *Louisiana Planter*, March 22, 1919.)

The value of the rubber manufactures in the United States for the year 1917 was $900,000,000. This is approximately seven times as much as the next largest manufacturing country, Great Britain. In ten years the United States has increassd its consumption of crude rubber from 24,000 to 177,000 tons, while Great Britain has increased her consumption from 14,000 to 26,000 tons. (The *India Rubber World*, January 1, 1919.)

Estimates by the Brazilian Minister of Agriculture indicate that the crop of beans in Brazil during the present year will reach 350,000 tons. Brazil imported beans in large quantities before the war, but domestic production now meets the demand of the country, and leaves a large exportable surplus. (The *Weekly Bulletin.*, Department of Trade and Commerce, Canada, January 27, 1919.)

In an article published in *L'Agronomie Coloniale*, November-December 1918, Dr. Jacques Silhol advocates the employment of kapok, the fibre contained in the pods of the silk-cotton tree (*Eriodendron anfractuosum*) as an excellent material for surgical dressings. He says that for eight months he has entirely replaced cotton for this purpose by kapok in the hospital of the Jardin Colonial, Paris.

The war values of sugar have had decided effect upon land values in Barbados.. The Barbados *Agricultural Reporter*, December 28, 1918, reports the sale during the year of thirty-three estates of a total acreage of 9,132 acres. The total amount of the prices paid reached £808,994. Of these plantations the largest contained 1,104 acres, and the smallest, 42 acres. The price paid for several of these was over £100 per acre.

In the report of the Commissioner of Agriculture and Labour of Porto Rico on the year 1918, it is noticed that the Governor of Porto Rico issued a Proclamation on May 28, 1918, setting apart as insular forest all the mangrove on the coast of the island of Porto Rico and adjacent islands, whereby the felling of trees thereon, and the taking away of any wood therefrom for fuel, charcoal, or any other purpose is prohibited. This measure is a very opportune one, because the present circumstances call for the utmost care of the natural forest resources of the island.

It is suggested in the *Journal of the Jamaica Agricultural Society* that the burning of coco-nut husks might very possibly yield an important by-product on coco-nut estates. The ash contains a high proportion of potash, 30 per cent. or more, and the husks of 1,000 nuts are estimated to yield about 25lb. of potash. Estates making copra have also the ash of the shell, which contains about 45 per cent. potash. At the present price of potash it would seem that the by-product might more than pay for the cost of erecting a special kiln or furnace.

The value of careful selection of cotton seed has often been emphasized in this Journal. An interesting account of tobacco cultivation in Rhodesia, which appears in the *Rhodesia Agricultural Journal*, February 1919, emphasizes the same necessity and importance of selecting tobacco seed. The writer states that no permanent improvement can be effected regarding the quality of Rhodesian tobacco, until the growers, instead of annually importing seed, practice systematic seed selection, and thus breed up the several varieties so that they are adapted to the local conditions of soil and climate.

Prior to the war the United States used more than 1,000,000 tons of potash salts each year, and it has been supposed that the cutting off of a large part of this supply owing to the war was a keen deprivation to the farmer by whom it was used as a fertilizer. With much energy, domestic production equivalent to about one-fourth the former importation had been built up. Now, however, it is unexpectedly disclosed that there is little or no market for potash either at the high prices that have prevailed or even at a considerably lower price. No satisfactory explanation of this situation seems to be offered. (The *Weekly Bulletin*, Department of Trade and Commerce, March 3, 1919.)

Everyone knows that all kinds of fruit, if they are to keep well, should be carefully picked, and not shaken off the trees on to the ground. An ingenious way of constructing a simple home-made picker is described in the *Journal of the Jamaica Agricultural Society*, January 1919. After husking carefully a large sized coconut, cut it exactly in half crosswise. Clean out the nut. Firmly affix one half of the shell to a long straight stick, attach the other half firmly to a short piece of wood which is to be bolted by its middle to the long rod in such a way that it works like the jaws of a pair of scissors, and the two halves of the coco-nut come together exactly. A strong cord or wire is then attached to the projecting arm by which the nut can be opened or shut over the fruit to be picked.

HE IMPROVEMENT OF THE YIELD OF SEA ISLAND COTTON IN THE WEST INDIES BY THE ISOLATION OF PURE STRAINS.

In a paper contributed to the *West Indian Bulletin*, l. XVII, No. 3, Mr. S. C. Harland, B.Sc., Assistant for tton Research on the staff of the Imperial Department of riculture for the West Indies, points out the steps that ve already been taken in this direction, and describes some- at elaborate experiments undertaken by himself with a w of increasing the yield of lint by still further isolation pure strains of cotton. Most of this paper is reproduced ow.

Since the year 1903 when the Sea Island cotton industry s first started in the West Indies, attempts have been made the agricultural officers in the various islands to ain varieties suitable for their own special conditions, and o to maintain the standard of quality of the lint at as high level as possible. The method followed by all workers ncerned was essentially the same in principle. Certain nts were selected in the field for good vegetative characters. ter this the lint and seed characters were examined in the oratory, and finally the best were chosen for planting progeny rows. In the next year the best were again chosen, d the same procedure followed, so that the final result has en that in St. Vincent, St. Kitts, Monserrat, and Antigua, e general appearance of the plants in field crop is now narkably uniform, and there is a notable freedom from the ferior hybrids of Upland origin which were frequently seen the first year of the industry. In short, the effect of the thod followed has been not only to render the crop far more iform than when it was first grown, but the elimination of ferior types has led to a marked improvement in the quality the lint—an improvement which is reflected in the high ices which the spinners are willing to pay for it. Incidentally ch island has had its own problems to face. In St. ncent the yield has never been altogether satisfactory from e point of view of the planter, and efforts have been made overcome the lowering effects of cryptogamic disease on ld by the selection of higher yielding and resistant varieties. Montserrat a good deal has been done to improve the quality the cotton. Montserrat has been discriminated against in e past on account of the relatively coarse nature of its tton, but Mr. Robson has shown that cotton of very fine ality can be grown in that island. In Antigua, besides deavouring to improve the quality of the lint, efforts have en made by the Agricultural Department to produce a type nich will yield well on the heavy soils of that island.

It will be seen that the system of selection so far llowed is the same in principle as the Vilmorin system of digree selection, which is used extensively, and with great ccess, at the famous plant breeding station of Svalof in veden, in connexion with the improvement of cereal crops.

The weak points in the West Indian method have been at until recently very little attempt has been made to termine statistically how far the various strains were pure r the character selected, and also that the frequent contami- ation by cross-fertilization was not taken into account.

The work of Dr. Lawrence Balls in Egypt in the oduction of pure strains of Egyptian cotton has led West dian workers to realize that the accumulation of statistical ta in regard to the various characters studied, and also e protection of the strains worked with from cross- rtilization must form an essential part of the work of cotton eeding

At the outset we may state that the work of cotton improvement must always bear a dual aspect. On the one hand, the quality of the lint must be satisfactory to the spinner; on the other hand, the planter naturally desires to obtained the largest profit from his land.

It will be seen that the yield of lint per acre depends on a large number of factors, morphological and physiological. It is by the interaction on these factors at their optimum that the highest yield is built up. The failure of any one factor to co-operate efficiently tends to lower the yield For example, if the weather conditions are unfavourable—if there is too much or too little rain—then the number of bolls per plant is reduced by shedding, and the yield is immediately lowered. So also, if the weight of lint per seed is zero, the yield is zero. Bearing in mind that yield is, in the West Indies, primarily dependent on weather conditions, it is a matter of importance to make a thorough study of the morphological and physiological characters which affect yield. Weather conditions cannot be controlled, but at least an endeavour can be made to produce a variety, theh ereditary endowment of which will interact with environmental conditions to the best advantage. The comparison of different strains in respect of their yielding capacity must necessarily prove an extremely difficult task. It is clear that the most logical method of improving yield must be to determine, firstly, what is the range of variation existing in Sea Island cotton in respect of the morphological characters concerned; secondly, to isolate strains with the highest maxima; and thirdly, to produce strains possessing the best combination of morphological characters consistent with a high grade lint. The conclusions of Balls in regard to the composition of Egyptian cotton are broadly true of Sea Island cotton also, i.e. Sea Island cotton consists of an enormous number of types which are different both physiologically and morphologically. By self-fertilization and selection, strains pure to any given character can be obtained, and it is certain that the method of pedigree selection is capable of yielding rich results in a comparatively short period, if the work can be conducted on a large enough scale.

After describing in detail his method of work, and the results obtained from each of his numerous experiments, which are very carefully and technically tabulated, Mr. Harland summarizes his conclusions as follows:—

'1. It is pointed out in this paper that the yield of Sea Island cotton depends on a large number of factors both morphological and physiological. Any scheme of selection must aim at a type the hereditary endowment of which will interact to the best advantage with environmental conditions.

'2. The morphological characters of Sea Island cotton which are concerned with yield are discussed. It is shown that in respect of every one of these characters a marked improvement can be effected by self-fertilization and selection.

'3. The relative importance of lint index and lint percentage, as factors in selection work, is dealt with in some detail.

'4. By following the methods of selection outlined in this paper it has been possible to insolate a strain of Sea Island cotton with a weight of lint per boll 31 per cent. greater than that of the ordinary type grown in the island.'

The demand for both sisal and sponge, the two principal commodities exported from the Bahamas, has been increasing steadily since the outbreak of the war. The value of the former in 1917-18 was £179,195 as against £47,219 in 1914-15, and of the latter £147,072 as against £93,395. (*Colonial Reports*, Annual, No. 978.)

CASSAVA EXPERIMENTS IN TRINIDAD.

(Concluded.)

The following is the conclusion of the account of experiments in the cultivation of cassava at the Government Farm, St. Augustine, Trinidad, which appeared in the *Bulletin of the Department of Agriculture, Trinidad and Tobago,* Vol. XVII, part 4, 1918, the first part of which was reproduced in the previous issue of this Journal:—

From 1916 experiments have been carried out with the object of ascertaining the best time for planting cassava. Accordingly, from the end of April and thence monthly to March of the following year, duplicate plots were planted of the same variety. These plots were reaped, and the percentage of starch determined, between September and October, when the plants were from six to seventeen months of age according to the date planted.

The results obtained for 1917-18 experiments are similar to, and in every respect confirm, those obtained the previous year.

In this experiment twelve duplicate plots were planted about the middle of April. Two plots were reaped in the middle of October and thence monthly to September of the following year, so that the cassava was from six to seventeen months old. The percentage of starch was also estimated in samples from these plots about twenty-four hours after they were reaped.

The results obtained for the 1917-18 experiments also are similar to and confirm the results of the previous year.

The results recorded show that: (1) the yield of the roots has increased generally from month to month with the age of the plants; (2) that the percentage of starch does not necessarily increase with the age of the plants, but that it is subject to great fluctuations according to the weather experienced at time of reaping.

From all the plots reaped in July, August, and September, it was observed that a large proportion of the tubers had rotted, and this may account for the fact that no increase in yield was obtained from these plots as compared with the plot reaped in June. From this it is evident that cassava should be reaped before July, and it should then be not less than sixteen to seventeen months old, as a better yield may be expected at that age than at fourteen to fifteen months of age.

An important consideration in the growing of cassava is not only to obtain the largest tonnage of roots per acre, but also the highest percentage of starch in the reots at the time of reaping. So far as has been ascertained, there is little or no difference in the percentage of starch from the different varieties.

The age of the plants also appears to exert very little influence on the percentage of starch in the roots, at least for cassava over eight months of age. For example, cassava ten and eleven months old, reaped in the dry season, contained a larger percentage of starch than cassava fifteen, sixteen, and seventeen months of age, reaped during the wet season. All the determinations made, over a period of two years, show that cassava reaped between July and December, seldom contains more than 22 per cent. of starch, but that the amount usually found varies from 15 to 18 per cent. Reaped between January and June, cassava of the same age seldom contains less than 22 per cent. of starch, and often reaches 1[illegible] in March to April. The dry season [illegible] would appear to be the proper season for reaping the [illegible] up the plant[illegible]

season would be from September to November, so that the roots may be reaped between February and April at seventeen and eighteen months of age.

Preliminary small scale manurial experiments made on plots of approximately one-fourhundredths of an acre show that a yield of from 10 to 13 tons of roots per acre may be obtained from an application of 20 tons pen manure or 300 lb. artificial manures per acre. The pen manure plot gave a yield of 13·45 tons, and the two artificial manure plots 10·32 and 11·60 tons of roots per acre. The artificial manure applied consisted of a mixture of 30 lb. sulphate of ammonia, 180 lb. dissolved bones, 55 lb. fine bone-meal, and 45 lb. sulphate of potash. An extra amount of sulphate of potash, at the rate of 100 lb. per acre, was applied to the plot which gave 11·60 tons of roots per acre. These experiments were made with variety 'Sellier', and the control plots only gave 4·85 tons per acre. The yield from the control plots is low for this variety, and is accounted for by the fact that they were overshaded by the fast growth of the manured plots. The average yield for variety 'Sellier' for the past two years has been from 7 to 8 tons of roots per acre

Owing to the difficulty of obtaining high yielding varieties, and the low yield obtained from most of the local varieties, attempts have been made at growing new varieties from seed. Cassava does not seed very profusely, and some difficulty has been experienced in collecting good seed, as only a small proportion of the seed appears to come to maturity.

Out of thirty seedlings raised in 1916, six have given sufficiently promising yields to be propagated by cuttings.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. During the month of March plant distribution included 144 Gliricidia cuttings and 13 packets of vegetable seeds. Mr. Brooks states that the lime crop is over, and reaping operations were still in progress in connexion with the sugar crop. During the month a leaflet on Rice Cultivation was issued. The total rainfall recorded at the Botanic Gardens, Castries, was 2·87 inches; the record at the Agricultura and Botanic Station, Choiseul, was 49 parts.

DOMINICA. From notes forwarded by Mr. Joseph Jones, Agricultural Superintendent and Curator, it appears that during the month of March 20 barrels of fruit were reaped from the lime experiment station, making a total for the year of 1,080 barrels. Plant distribution included: onion seedlings, 5,000; cane cuttings, 3,000; vegetable seeds sold, 330 packets. There was considerable activity in the fresh lime trade, the local price of which advanced from 16*s.* to 25*s.* per barrel during the month. Ripe limes remained unchanged at 5*s.* per barrel. Green limes are scarce. Cured cacao is in demand at 17c. per lb. locally. Three bags of camphor leaves were sent to the Government Laboratory, Antigua, for trial, distillation. The rainfall for the month recorded at the Botanic Gardens, was 69 parts. This, Mr. Jones states, is the lowest fall on record for March since the Gardens were started. The rainfall during the quarter totalled 4·63 inches. The drought is becoming severe along the south leeward coast; there is sufficient rain, however, in other districts of the island.

MONTSERRAT. In notes of interest for the month of March, the Curator, Mr. W. Robson, states that the following plant distribution was effected: bay plants, 50; papaws, 50; yams, 515; beans, 19 lb.; castor oil seeds, 5 lb. The usual distillations of bay leaves were made, and weekly distillations are being continued; 70 lb. of oil from the experiment plot were shipped to England. The plot of twenty-two varieties of plant sugar-canes at Farrels estate was reaped, the heaviest cropper being Sealy Seedling, followed by B.H.10 (12). A very considerable area of the new cotton crop was planted during the first week in March, but since then the weather has been very dry. Some disappointment was experienced through the distribution of cotton seeds with a low viability from certain ginneries. This, Mr. Robson says, is a matter for which there is little excuse, as it indicates carelessness in the handling of the seed at some stage. Most of the large estates will this year adopt the plan of leaving two plants in a hole, instead of a single plant as in previous years. It would at present appear that the acreage under cotton this season will be the largest so far in the history of the island. Provision crops, chiefly sweet potatoes, still remain plentiful. Cotton stainers are still seen to be infesting weeds on the borders of old cotton fields, and have even invaded some of the newly planted areas. The destruction of silk-cotton trees is proceeding fairly satisfactorily, 700 trees having been felled to date. It is difficult to estimate the total number of these trees on the island, but it seems likely that those felled do not represent one-half the total. Further attempts have been made in preparing papain from the several strains of papaw in cultivation at the Station, the object being to ascertain which of the seven yields the largest proportion of papain from a given quantity of milk. The rainfall recorded at Grove Station to March 29 was 2·15 inches. Some of the outlying districts of the island have been somewhat more fortunate during the last fortnight. Seeds of the St. Vincent and St. Kitts cottons have been received for comparative trials with the local strains, and these will be planted at the first opportunity.

ANTIGUA. Plant distribution during March included 3,950 onion plants and 8 decorative. Mr. Jackson states that the reaping of the cane crop is now in full swing, and that notwithstanding the dry weather, the young cane crop continues to improve. The quantity of cotton ginned and sold to the Admiralty amounts to 50,940 lb. Of the 8,729½ lb. purchased from peasants by the Antigua Cotton Growers' Association, 889lb. were stains. The work of destroying host plants of the cotton stainer was commenced during the month. All vegetation throughout the island requires rain. The latter part of March was exceedingly dry; practically no rain fell for the last two weeks. The rainfall recorded at the Botanic Station for the month was 1·99 inches. A visit of Mr. H. A. Ballou, Entomologist on the staff of the Imperial Department of Agriculture during the month in connexion with depredations of hard back grubs is recorded.

ST. KITTS. During the month of March plant distribution included: cane plants, 850; Para peas, 8 lb; ornamental plants, 20. The weather, Mr. Shepherd states, has been very dry, the rainfall recorded for the month being only 1·71 inches, and for the year to date 3·90 inches. The reaping of the cane crop is in rapid progress, and the returns of cane per acre are up to the estimate, being about 20 tons in the Northern district, and from 12 to 15 tons in the Valley district. The muscovado estates are chiefly making sugar, for which a high price is obtained. Preparation for cotton is going on rapidly, and in the Northern district a good area of cotton has been planted. The destruction of the native food plants of the cotton stainer has been actively carried on. The cotton stainer has appeared, even from a field of cotton that was allowed to remain over for a month.

VIRGIN ISLANDS. Mr. W. C. Fishlock, Curator of the Botanic Station, Tortola, writes to say that during the month of February work in the experiment station was of a routine nature. The cotton crop is drawing to a close: owing to dry weather, pickings will be completed earlier than usual. It is proposed to close down the cotton factory early in May to foster the idea of having a close season. The month of February was very dry, the rainfall recorded at the Botanic Station being only 95 parts, as compared with 2·88 inches, the average for the preceding eighteen years.

AGRICULTURE IN BARBADOS.

A very severe drought is in progress, and vegetation of every kind is beginning to show signs of the strain to which it is being subjected. The pastures have turned a reddish brown colour almost everywhere, and the earth is cracking extensively.

In our last report we stated that last month was the driest March experienced for over fifty years. This year the reading during March of one gauge book in Christ Church is: 7th, 8 parts; 13th, 15 parts; 18th, 11 parts. In the centre of the island the rainfall to date is just half what it was last year, and only slightly over one-third of the total for the first quarter of 1917.

Owing to the fact that grinding operations on some estates were started two or three weeks later this year than last, reaping is not as advanced as at this time last year. The progress made is, however, not unsatisfactory, but reaping is likely to be extended to the end of June in districts where the end of May is usually reckoned as closing the crop season. Everywhere we learn of a yield somewhat in advance of last season's, and this year's crop would, in all probability, have been as heavy as that reaped in 1916, had the rains kept up until January.

Generally speaking, the factories are this year turning out more sugar than during the season of 1917 and 1918. This is due not only to the fact that the yield is better, but also to the better prices offered for canes. To make the best of the sugar industry of the island it should be possible for the crop of every estate to be reaped within four months with the highest percentage of recovery. This could be done if, when machinery can again be readily obtained, planters would co-operate and place well-equipped centrals in proper positions.

The continued dry weather is beginning to tell on some of the fields of young canes which have made an early start, while shoots from the supplies of recent date date are dying from lack of moisture. On the other hand, there are some fields, particularly some in the back soil, that have been trashed which are looking remarkably well, considering the severity of the weather. We were recently quite pleased to see how well some of the fields in the driest part of St. Philip are looking. Each variety is holding its own, but the B. H. 10 (12) is bunching more vigorously than the others. The prevailing weather is a test of good tillage, liberal manuring, and the selection of healthy plants.

Potatoes are still being retailed at [illegible] for 10c. The wonder is that the supply of th[illegible] has kept up so well.

As a rule at this time the [illegible] £179,1[illegible] to be seen in various plots about th[illegible] 17 07?

[illegible] any field. (1[illegible] 1919.)

MARKET REPORTS.

London.—The West India Committee Circular, February 20.

Balata—Venezuelan Block, no quotations; Sheet, no quotations.
Beeswax—No quotations.
Cacao—Trinidad, 90/-; Grenada, 85/-; Jamaica, no quotations.
Copra—£34.
Honey—West Indian, [10/-.
Lime Juice—Raw, no quotations; Concentrated, no quotations.
Pimento—No quotations.
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, February 25, 1919.

Bay Oil—Lower, at 14*s.* to 15*s.*
Lime Oil—Slow, at 5*s.* 6*d.* for West Indian distilled, and 14*s.* for hand-pressed.
Orange Oil—West Indian, 7*s.* 6*d.* per lb.

Barbados.—Messrs. T. S. Garraway & Co., April 1.

Arrowroot—$8·75 per 100 lb.
Cacao—$19·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—No quotations.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—Dark Crystals, $5·50.

Trinidad.—Messrs. Gordon, Grant & Co., March 5.

Cacao—Venezuelan, $18·50 to $21·00; Trinidad, $17·50 to $21·50.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 20c. per lb..
Copra—$4·50 per 100 lb.
Dhal—No quotations.
Onions—$6·00 to $6·50 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $3·00 to $3·50 per 100 lb.
Rice—Yellow, $13·00 to $14·00; White, $9·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs Gillespie Bros & Co., February 25.

Cacao—Caracas, 18c. to 18½c.; Grenada, 17c. to 18c. Trinidad, 18c. to 19c.; Jamaica, 15c. to 15½c.
Coco-nuts—Jamaica selects, $50·00; Trinidad culls, $26·00 to $27·00 per M.
Coffee—Jamaica, 16c. to 19c. per lb.
Ginger—16½c. to 19c. per lb.
Goat Skins—Jamaica $1·05; Antigua and Barbados, 90c. to 95c.; St. Thomas and St. Kitts, 90c. to 95c.
Grape Fruit—Jamaica, $3·00 to $3·50.
Limes—Nominal $6·00 to $6·50.
Mace—40c. to 42c. per lb.
Nutmegs—25c. to 26c.
Oranges—$3·00 to $3·25.
Pimento—7½c. to 8c. per lb.
Sugar—Centrifugals, 96°, 6·80c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

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Canada: Lewis W. Clemens, 301, Yonge Street, Toronto.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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	PAGE.
Agriculture in Barbados	13
Cacao Production, Science in	141
Chrysothamnus or Sierra Rubber	131
Clidemia hirta A Noxious Weed in Fiji	137
Cotton:—	
Sea Island Cotton Market	134
The Cotton Crop in Montserrat	134
Department News	131
Departmental Reports	132
Fog Moisture, Precipitation of by Trees	134
Gleanings	140
Grenada Agricultural Department	135
Ground Nut Flour as Human Food	132
Industrial Alcohol in Canada	137
Items of Local Interest	133
Lime Cultivation in Dominica	142
Limes, Green, Wastage of in Shipment	139
Market Reports	144
Mongoose, The Food of, in Trinidad	138
Mycology, A Broader	129
Notes and Comments	136
Onion Growing in Dominica	136
Phosphate in Barbuda	136
Plant Diseases:—	
The Susceptibility of Rutaceous Plants to Citrus Canker	142
Plant Legislation in Grenada, Recent	136
Snake Gourd	137
West Indian Products	143

A Broader Mycology.

II.

IN the editorial of the previous issue of this Journal, portions of a letter of Mr. C. O. Farquharson to the Assistant Director of the Royal Botanic Gardens, Kew, were quoted as evidencing the necessity for a broad outlook on the part of those engaged in the scientific investigation of agricultural problems. The fact that a personal investigation of such questions under actual field conditions is requisite, if satisfactory conclusions are to be reached, is emphasized in the letter quoted.

Another requisite for successful experimentation is what may be called a scientific imaginative faculty. Not only must the investigator take a broad view of the subject he may have to study, but he must look far ahead, and be able to devise appropriate methods of experiment. Otherwise his research is likely to become merely a matter of attention to insignificant details, which do not tend to any real elucidation of the questions involved. Some further quotations from Mr. Farquharson's letter illustrate from his experience this point In dealing with cotton and ground nut troubles his scientific imagination evidently stood him in good stead. He writes:—

> The optimum planting date for American cotton here is about July 17. Every day planting is delayed after that in a normal rainfall year increases the risk of a short crop. The great limiting factor after that is the Harmattan, which comes on about November or December after the rains have stopped, but before any marked response to that, in the way of leaf fall, has set in. Once the Harmattan sets in (it is more or less intense from the start) defoliation is rapid. That is followed by a meagre flush of new foliage, the leaves of which are greatly reduced in size. Flowers may still, and do, continue to appear, but the bolls are undersized, are often badly worm-infested, and when mature their cotton is rarely worth picking. Now you might think that it might pay to plant a week or two or even a month earlier. Well, I tested the point by serial plantings, and found that June plantings or even more abnormally early are hopeless: the plants became the prey of the anthracnose fungus, Fusariums, physiological "red rust", and dear knows what else. By the end of July they are the most stunted, miserable, flowerless, boll-less things you could imagine, blighted beyond recovery. I do not believe that spraying would

be of the least good for the fungi, and even if the fungi were eliminated, there would still be the other physiological troubles.

'The ground nut here is another good instance. Ground nuts may be planted here up to the end of April (the rains begin with the tornadoes about the end of March or even earlier), or if the rains are late, into May. Let us say that up to the time when the vine has stopped growing and is on the turn, it gets x inches of rain. We used to plant (up to 1914) about June and even later. Planting then, it is quite possible that the crops, before the rains stop, will get x inches of rain, at times more, at times less. But the bulk of the plants will be stunted, chlorotic, or mottled green and yellow, and instead of spreading normally (I am not referring to normal erect-growing types) grow erect, the leaves are very much reduced in size, and hardly any nuts are formed. When I came here in 1912 I never questioned the time of planting. I took it for granted as correct. I found myself up against this mottling and bunching, could find neither insects nor fungi, and the tubercles on the roots were apparently normal. The natives do not grow them much here, and, truth to tell, I did not think of asking them about the crop. I could not get to Northern Nigeria, where I knew the nuts must grow well, and had to make the best of it. I tried all sorts of ideas, but mainly kept my eyes open for a field clue.

'I got this indirectly when trying to solve a rather similar cotton (native type) problem. Up to 1914 our highest yield of ground nuts as harvested, amounted to just over 500 lb. per acre, which would probably have weighed about 300 lb. when dry (unshelled nuts). We had many worse than that, which would not bear recording, down to 11 lb. per acre. Now normally we get from 1,000 to 3,000 lb. of well dried nuts per acre (equivalent to about a ton as harvested). With the aid of lime I secured 1,700 lb. once, but the liming had nothing to do with disease. In a 10-acre field one cannot see a "bunched" plant.

'The cotton disease that gave me the clue was solved in a different way. Up here "native" cottons are affected by a serious and incurable disease, of "physiological" origin. Flowering is greatly reduced, and, of course, bolling. The Upland Cottons (Americans of our introduction) were never affected. I found the solution of that from sheer field observation. Native plants near the coast, where the humidity average is much higher, grow normally. The key to the problem lay in the fact that the Americans were Upland cottons. Their hirsuteness is an upland character. The natives (*G. vitifolium* and *peruvianum* strains) are glabrous. It took two whole tours before these obvious facts sank into my brain.

'The remedy for the disease was to grow the right cotton in the right place. Unfortunately for the cotton spinners, cacao has long since ousted cotton from the high humidity belt. It was only from noticing a few stray survivors of bygone cultivation at Bonny that I tumbled to the cause of the troubles.

'Before leaving the ground nut, I may say that my theory to account for the facts is that it is not the leguminous portion of the ground nut that suffers in the mid-rainy season planting, but the nodule organism that is "diseased" (perhaps from too low a soil temperature during the period immediately after it infects its host, or perhaps even before it has become "involuted"), or because the soil then being at its maximum wetness, the organism in the soil has become involuted. When it does infect the ground nut, it either reverts to its ancestral parasitism, or, being itself below par, while not becoming a parasite, is yet unable to fulfill all the terms of the partnership.

'Now you will see what I mean by field physiology. I doubt if any of the problems I have mentioned could have been solved in a laboratory, or at any rate only with the utmost difficulty, and with good fortune. I do not suggest that the problems are solved in the ulitmate sense, but at any rate I know the practical remedies, and this is a great deal.'

With regard to bud rot of coco-nut trees, Mr. Farquharson seems to think that much of the trouble attributed to that disease is possibly due rather to physiological causes, as will be seen in the following extract. This may be correct, but, on the other hand, bud rot in some coco-nut-growing countries is a very serious matter, as has been proved in Ceylon and Cuba, for instance. There is no doubt, however, that care of the trees and attention to the soil enable them to be more resistant to this disease:—

'As you know, we have been having a great time with coco-nut bud rot. In regard to that disease, it seems to me that too much has been made of *Bacillus coli*, and the elementary fact has been lost sight of that dicotyledonous plants die back following asphyxiation of their roots, for want of drainage, or other adverse soil factors. The first symptom is the death of the growing point of the main axis, if there is one, or of that and the side branches. Now a palm has only got *one* to go on with, outside its fronds, and when that goes there is no hope of recovery. That growing

point can "go" exactly as one or many of the growing points of a dicotyledonous tree may, and for the same reasons. The essential remedy is proper cultivation, growing the palms in the proper place, on a proper soil, in the proper way, with plenty of light and air. People have been so obsessed with the maritime habitat legend that they fail to see that the palm does well there because there are few competitors, and it can get abundance of light to seaward, and plenty of breeze.'

Mr. Farquharson evidently agrees with the views of most scientific observers of the cacao industry, namely that the only way in which good results can be obtained in this direction is by striving for improvement both in methods of cultivation and of preparation of the product. He states:—

'I hold strong views on cacao disease out here. The pest of cacao is the native. He doesn't "cultivate" cacao. He exploits a "weed" that yields a product closely allied to cacao. I told the Government here that cacao grew like a weed, that in fact it *had* to grow like a weed in order to survive. I illustrated this by reminding them how difficult it is to keep a prize vegetable (raised by long and intelligent selection) up to the prize standard. If it is put on poor land, and is untended and generally neglected, it will have to revert to "weed-dom" if it is to survive at all, and if it does, it will be no sweet and tender vegetable, but a hard-bitten. fibrous, just edible weed.

'People talk at length about the phenomenal progress of cacao on the Gold Coast. I took it on myself (when acting Director of Agriculture) to tell the Government that it would have been better for the cacao had the rate of increased production (which is not progress if the product is the worst that comes into the world's market), been very much slower.'

The much higher price which is fetched by Trinidad and Grenada cacao on the London market, as compared with that of cacao from the Gold Coast and Nigeria, is due to the fact not that any superior variety is cultivated in those islands, for it would app ar that the bulk of the cacao cultivated there is of the same variety as that grown in West Africa, but because the cacao planters in Grenada and Trinidad take pains in keeping their trees in good health, and in preparing the beans as carefully as possible.

It has seemed worth while to quote *in extenso* from Mr. Farquharson's interesting letter, seeing that the whole trend of that letter is to point out the necessity that men who are responsible for giving advice in technical matters relating to agriculture should have, in addition to the highest possible training in technology, a very wide understanding of the general conditions under which plants grow, and a practical acquaintance with agricultural details. Absence of this knowledge in scientific men often leads the general public to regard them as devoid of common understanding, and even at times as subjects of unseemly jests.

CHRYSOTHAMNUS OR SIERRA RUBBER.

Shortly after the United States entered the war an investigation was undertaken by experts of the University of California, as to the possibility of obtaining rubber commercially from various wild plants which grow abundantly on the Sierras, and in other parts of the Western States. An article in the *India Rubber World*, April 1, 1919, draws attention to these investigations, which were under the charge of Prof. H. M. Hall, of the University of California.

Professor Hall is quite certain that rubber cannot at present be obtained commercially from the wild plants, at least at the present price of rubber. The most interesting and promising plant for the purpose appears to be, in his opinion, *Chrysothamnus nauseosus*, known in California as 'common green.' Like the 'guayule' it belongs to the natural order Compositae.

For two months the Professor carried on field surveys in eight of the Western States, in order to make estimates of the tonnage and distribution of rubber-carrying shrubs, and to gather samples for chemical analysis.

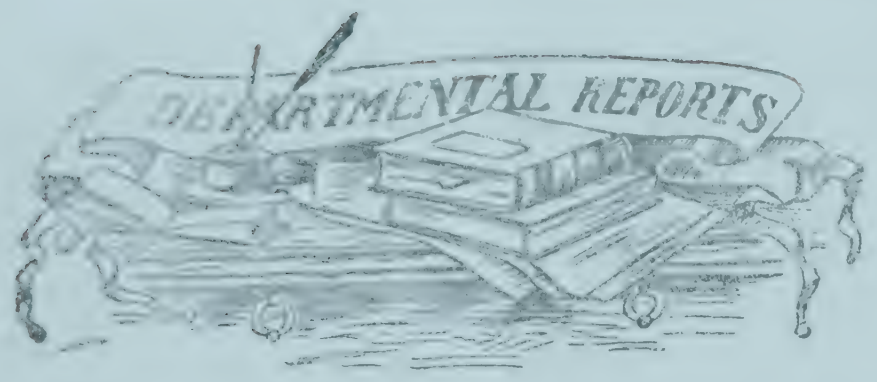
In order to give an idea of the numerous kinds of rubber-producing plants in the Californian Sierras, it may be stated that there are, according to Prof. Marcus E. Jones, who is Professor Hall's assistant in his research work, no less than seventy species of them in that region, containing from 1 to 10 per cent. of rubber.

Chrysothamnus nauseosus, which, as is stated above, appears to be most interesting in this connexion, is a shrub growing 7 feet high, but the precentage of rubber contained averages only about 3 per cent., although individual plants, and some of them very large ones, contain as much as 6 per cent. This percentage is of absolutely pure rubber, and calculated on dry weight. The rubber is said to be somewhat better than that from 'guayule', the production of which has been noticed in former issues of this Journal.

This investigation into the possible domestic production of rubber from indigenous plants in the United States may perhaps lead to the utilization of the great waste lands of parts of the West in the cultivation of rubber-producing plants. These lands are valuable and cheap, and the rubber-producing plants need no irrigation.

DEPARTMENT NEWS.

Mr. W. Nowell, D.I.C., Mycologist on the staff of theImperial Department of Agriculture, left Barbados for England, on leave of absence, on April 29.



TORTOLA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1917-18.

From the report on the Agricultural Department of the Virgin Islands, 1917-18, which has been just issued, it appears that the damages experienced with regard to the trees—ornamental and economic—in the garden of the experiment station are being gradually repaired. It may be noticed that the work in the small experiment station in Tortola is more of the character of demonstration in the practical cultivation of economic plants, than of what might be termed purely experiment work. This demonstration work must be of educatioual value to the people of the Presidency. The following crops were under such demonstration cultivation during the year in the station: sugar-cane, sweet potatoes, coco-nuts, onions, Indian corn, cassava, beans of several varieties, and bay trees. With regard to the sugar-cane grown, it is stated that B. 208 is regarded with favour by the small cane growers of Tortola. It must be remembered that the sugar-cane industry in the Presidency is a very small one, cultivation being of a primitive type usually, and the manufacture of sugar being perhaps still more primitive. There is no export of the product, in fact enough is not produced to meet the local consumption.

For the past eight years experiments in the cultivation of sweet potatoes of a considerable number of varieties have been conducted under conditions of such simple culture as to be within the capacity of any peasant grower.

With regard to the onion cultivation, it appears that most of the onion seed imported from Teneriffe is planted in the station, the seedlings being afterwards sold at 3c. per 100 to growers. Mr. Fishlock, the Curator, considers that the proper time for planting onion seed in Tortola is in November or early December, although on the hills in Tortola it is possible to plant until late in January. A useful hint is given with regard to the treatment of onion seeds to protect them from the depredations of ants. Before sowing, the seeds are shaken up in red lead powder, and this has proved an effectual method for preventing the ants carrying off the seed. Mr. Fishlock has also found that covering the seed-beds with grass after sowing the seed keeps the surface of the soil moist, and ensures quick germination.

Although the young bay trees in the experiment station suffered little from the hurricane, the attacks of the sugar-cane root borer (*Diaprepes abbreviatus spengleri*) have caused considerable damage both to the roots of the trees, which are eaten by the larvae, and to the leaves and young twigs, on which the adult insect feeds. Mr. Fishlock points out also that an admixture of even a small quantity of leaves of the 'false' variety of Pimento with those of the variety producing the real bay oil spoils the product from a commercial point of view.

The large reduction in the amount of cotton grown in and exported from the Virgin Islands is regrettable. Whereas in 1914-15 there were shipped 31,549 lb. of Sea Island cotton and 3,652 lb. of native cotton, of the total value of £2,191, this amount has steadily dropped, until in the year under report only 10,403 lb. Sea Island and 2,355 lb. native, of the value of £1,677, is accounted for among the exports.

The weather during the year reported on was very dry. The rainfall recorded at the experiment station in Tortola for the twelve months was only 39·22 inches, as compared with an average for the preceding seventeen years of 53·46 inches.

GROUND NUT FLOUR AS HUMAN FOOD.

The nutritive property of the residual cake left after the oil has been extracted from ground nuts has caused it to be regarded for a long time as a valuable cattle food. An article in *Tropical Life* for March 1919, draws attention however to the introduction of certain improvements in the method of oil expression, whereby a cake can now be obtained, it is said, of a definite standard of purity, thus enabling the flour to be used as a nourishing and palatable food for human beings.

This standard ground nut cake has been designated 'nutamine', and the methods employed in preparing this article are described as follows: In order to 'pick over' the nuts more satisfactorily and effectively, it is suggested that they be cleansed on a mechanical washer, and then thoroughly dried in a mechanical drier. After this, the inner red skin is removed by means of a blast of hot air playing on the seeds while they are being whirled round in a large drum. In this way the seeds are dried, cracked, and the red skin blown away. By this method the preliminary drying of the seeds is avoided, and the cleaned seeds are left practically free of their red skin, and ready for oil expressing. To obtain good, clear oil and good cake, hydraulic presses are used, and the expression should always be carried out cold, as the resulting cold drawn oil is nearly colourless, has af pleasant taste and odour, and can be used as a substitute for olive oil. Such oil also keeps remarkably well.

The resulting cake, however, still contains between 10 to 15 per cent. of oil, and this is too much for the production of 'nutamine'. The cake must be subjected to a second expression, being warmed this time. The resulting oil, of an inferior grade, is widely used in soap making, and the cake left after this second pressure should contain about 5 per cent. of oil, the standard aimed at. This cake, when finely ground in an ordinary roller mill, and subsequently passed through a sieve, is the preparation known as 'nutamine'.

From this fine flour thus obtained, biscuits and many other articles for human consumption can be made, for if the oil has been properly removed, the flour has quite a pleasant taste, and possesses a high protein content. Being deficient in carbohydrates, the flour should be ordinarily mixed with a proportion of wheat flour, and this gives a highly nutritious mixture, and supplies a concentrated and economical food. Bread and biscuits made from the following recipe are said to keep well, and to possess a pleasant taste, the dried milk adding to the food value: Ground nut flour, 84 parts; dried milk, 14 parts; sodium bicarbonate, 2 parts. Biscuits made from such a mixture are reported to be light, and to keep well in a tin. It would appear, however, that should any one in these islands desire to make experiments with biscuits from ground nut flour, the quantity of fresh milk needed to moisten the flour could well take the place of the dried milk in the recipe given above.

It is stated that whilst wheat, oats, and several other cereals are markedly deficient in the so-called basic amino-acids, ground nut cake and flour contain a large amount of these. Hence the reason for the designation 'nutamine'.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. Mr. Sands writes to say that during the onth of March the weather was dry, and the reaping of aple crops was continued under good conditions. The estruction of cotton stalks was energetically undertaken. ood white cotton was picked in the Windward district. lthough cotton stainers became numerous during the month, e damage due to them was relatively small, owing to the teness of the infestation, and the fact that the crop was ractically finished. The new measures relating to the close eason should lead to still further control of the pest.

Special investigations of cotton fields made by the Agriultural Superintendent in certain districts revealed cotton ainer infestation, and a very high percentage of bolls with ternal boll disease. The selection and testing of cotton eedfor planting next season was supervised at the Ginnery, here 10 tons were required to be reserved. Cotton growers Bequia appreciated the beneficial result of the cotton stainer ontrol measures undertaken during the last season, and considerable extension of cotton planting is expected there uring the coming season. The rainfall recorded at the otanic Station for the month was 2·64 inches; at the Experient station the record was 2·71 inches.

NEVIS. Operations at the Experiment Station were ractically at a standstill during the month of March, r. Howell writes to say, on account of prevailing drought. otton demonstration, sugar-cane, and other plots are all epared, and are only awaiting rain to be planted. Regardg staple crops, the Agricultural Instructor states that the aping of the sugar-cane crop on many of the estates is most completed, but the returns continue poor. The young nes throughout the island are suffering much from want rain: planting is still in progress, but the fields have all own very badly, and a great deal of supplying had to be ne. Preparation for cotton planting throughout the island almost completed, except in the New Road district, where e close season has been extended to April 15. No planting as done during the month. The acreage under cotton ltivation for the coming season will be very much reduced account of shortage of labour and the anticipated high price r sugar. No planting of provision crops was done during e month on account of the dry weather, and there will be ortage within the next month or two. Mr. H. A. Ballou, ntomologist on the Staff of the Imperial Department of griculture, accompanied by Mr. F. R. Shepherd, Agricultural Superintendent, visited Nevis during the latter part of e month, and addressed a meeting of cotton growers held March 26, in connexion with cotton worms and the cotton ainer. Mr. Ballou remained in the island four days, during hich time he made observations with regard to the sudden sappearance of the cotton stainer. The rainfall recorded r the month was 1·33 inches; for the year to date, 71 inches.

VIRGIN ISLANDS. The Curator states that very little as done in the Experiment Station, Tortola, during the onth of March, beyond routine work. The dry weather perienced has been favourable to the maturing of a second cking of cotton, and there are indications that the crop is w nearly over. Regarding the sugar crop, Mr. Fishlock says at the quantity of canes handled at the Station was greater an that of last year, but the condition was very poor. The tal rainfall recorded at the Station for the month was 9 inch, as compared with 2·52 inches, the average for the receding eighteen years.

Attached to these notes is a report on the Experiment Station for the quarter ended March 31, which contains items of local interest already reproduced in previous numbers of the *Agricultural News*.

AGRICULTURE IN BARBADOS.

The drought continues without abatement, and April, like March, has been dry and warm, and, it goes without saying, unbearably dusty.

The earth has developed cracks, in many places 3 inches in width, and there are many stools of young canes that are isolated from the surrounding banks by cracks which encircle them.

The light showers which fell on the hills between April 7 and 13 revealed the fact that life still remained in some of the supplies which had not yet sprung. A few days after these showers, many tender shoots were to be seen peeping up in holes, which had previously shown no signs of life. No supplying could, however, be done, as a few hours afterwards it could hardly be observed that one drop of rain had fallen.

We are having convincing proof of the superiority of farmyard manure over every kind of fertilizer. We are also sure that in spite of the barsh weather, if the majority of fields had been rested, there would have been no cause for anxiety. Agriculture can be more conveniently and scientifically carried on under a rotation system. The problem of efficient manuring is solved, and the land would in all probability be kept clean with greater economy. We believe that the cost of establishing the present young crop is double what it would have been under the system to which we refer, a system which is correct both from the practical and the scientific point of view.

Where crops in the black soil consist of plant canes only, the average yield keeps well up to 30 tons per acre, but where first ratoons have been grown the average has fallen to 20 tons. We learn that in St. Andrew's parish the Ba. 6035 has yielded a very heavy tonnage. The cool, moist soil of this parish seems to be admirably suited to this seedling. The habits of the present favourites should be closely observed, and the experience gained applied. It would seem that the Ba. 6032 will not ratoon vigorously in the red soil, particularly if it is cut late. On the other hand, the B.H.10 (12) promises to be a hardy and satisfactory ratooner.

The weather has been too dry to continue the putting in of the first application of chemical manure to the ratoons, but, in spite of all circumstances, they are making progress.

The House of Assembly on March 25 did not renew the Vegetable Produce Bill. Planters will, therefore, now be under no legal obligation to plant ground provisions. We do not, however, believe that the removal of this obligation will, under favourable weather conditions, cause a scarcity of sweet potatoes. In those parts of the island in whichgro und provisions yield a large return, satisfactory areas will be planted, while the smallreturn obtained under the Vegetable Produce Bill from other districts will not be missed.There is also the fact that many planters are seeing the absolute necessity for growing rotation crops. This will increase the supply of potatoes in the districts which are not regarded as good provision ones. After canes, there is nothing that pays so well as potatoes. (The Barbados *Agricultural Reporter*, April 19, 1919.)

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended April 5, 1919, is as follows:—

ISLANDS. The market was quieter during the week, and the Exchange reports sales of only 75 bales.

There continues a demand for cotton slightly off in preparation, but the entire offerings of these qualities were disposed of last week, leaving a stock consisting largely of Fine to Fully Fine, which is bright fancy cotton, better than any selection that can be made out of the Georgia and Florida crops, and relatively the cheapest cotton for sale.

We quote, viz.:—

Fine to Fully Fine, @ 53c. to 53½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. There has been a good demand throughout the week for the limited offerings, resulting in sales of 429 bales, the buying being on account of the Northern Mills.

The interior markets are very firm, and the Savannah Factors are asking higher prices.

The better grades, Fancy, and Extra Choice, are very scarce and difficult to buy at quotations.

We quote, viz.:—

Fancy, 53c. to 53½c., f.o.b. and freight.
Extra Choice, 52c. to 52½c., f.o.b. and freight
Choice 50½c., f.o.b. and freight.
Extra Fine, 48½c, f.o.b. and freight.

The exports from Savannah for the week were: to Northern Mills 1,010 bales, Liverpool 375 bales. There were no exports from Jacksonville this week.

THE COTTON CROP IN MONTSERRAT.

Mr. W. Robson, Curator, Botanic Station, Montserrat, has informed the Imperial Commissioner of Agriculture that the total area under cotton in Montserrat during the season 1918-19 was 3,167 acres, as compared with 2,608 acres in the previous year. The present acreage is considerably the largest ever placed under this crop in the island. The total amount of lint produced was 438,222lb., giving an average yield per acre of 138lb., as compared with an average yield per acre of 157lb. in the year before. Although the average yield was distinctly low as compared with the previous three years, Mr. Robson considers the result to be, on the whole, very satisfactory, considering that the weather experienced during the critical period of the development of the crop was the worst in the history of the industry.

It may be noted that at least half of this crop was the production of small growers, who seem to be taking more and more interest in the cultivation of cotton. For this reason Mr. Robson believes that the area to be planted for the cotton crop of 1919-20 will be even larger than the record one of the crop just finished.

The position of the cotton industry in Montserrat is a very striking instance of the improvement in agricultural resources which may result from the careful cultivation of a new crop. Reference to the *West Indian Bulletin*, Vol. VIII p. 1, will show, in an article on the agricultural industries of Montserrat, by Sir Francis Watts, K.C.M.G., that up to the year 1892, the principal agricultural resource of Montserrat was sugar cane. In that year, out of a total value of exports from the island of about £29,000, the value of sugar exported was nearly £21,000. After that year, with a small fluctuation, the cultivation of sugar steadily declined, the total exports in 1904 of that commodity being only some £3,000. Although the value of the exports of lime and lime juice reached in that year £7,500, the decline in the sugar industry was reflected in the total exports, which were only some £21,000.

In the article above referred to, Sir Francis Watts made the following prophetic remark: 'Cotton growing has now become an important industry, and upon this it would seem the development of the island in the immediate future directly depends.' How true this remark was will be seen by reference to another article on the same subject, also by Sir Francis Watts, in the *West Indian Bulletin*, Vol. XV, p. 14, in which is noticed the steady progress in the commercial prosperity of Montserrat, the exports having risen from £21,000 in 1934 to £34,553 in 1914, of which cotton and cotton seed supplied £13,530. This increasing value of cotton to the revenue of the island evidently continues to the present time The cotton crop just reaped, of more than 430,000lb. represents at the present price, say 3*s.* per lb., something more than £65,000 in value.

It is no wonder, therefore, that the Montserrat cotton growers are increasing their acreage, and devoting their energies to the careful preservation of a good local strain of Sea Island cotton, as well as the eradication of pests and diseases inimical to that crop.

PRECIPITATION OF FOG MOISTURE BY TREES.

A paper on the above subject by Dr. George V. Perez, of Teneriffe, was published in a Spanish journal in January 1918, and has since been translated into French, and published as a leaflet for general distribution by the French Central Association for the care of mountain forests. The subject is so interesting that, although the conditions described in Cape Colony and the Canaries apply only to a very few spots in the more mountainous islands of the West Indies, a translation of the article is here given as one more argument in favour of the wise conservation of mountain forests which has been advocated in this Journal from time to time.

The celebrated mountain, nearly 3,000 feet high, situated to the south of the city of Cape Town forms, as is well known, a plateau on which the sea-breezes are condensed. The breezes blow there from the south-east, and prevail especially during the summer season. The travellers compare the mist which they deposit on the mountain to a cloak covering it.

Some years ago Dr. Marloth made some simple and enlightening experiments by placing two rain gauges in situations where this mist is formed. One was of the usual construction, while the other supported a score of rods about 15 inches long, joined together at their ends by metal gauze. The records showed that the ordinary gauge did not collect a single drop of water from December 21, 1902 to January 1, 1903, but that during the same period about 15 inches of water were collected in that on which the rods were erected; the total received up to February 15 in the first instrument was only some 5 inches, while the level in the second reached the almost incredible amount of nearly 78 inches.

It is to be remembered that the time of the year when this experiment was carried out is summer at that latitude,

and that it hardly ever rains there during the season; and moreover, that the sea-breezes blow then with greater force, and that the fog is condensed around Table Mountain most at that time.

In the Canaries the trade winds from the north east produce a similar phenomenon during the dry months of summer, when it does not rain, and the mist is condensed on the high mountains of those islands from about 2,000 to 4,000 feet up. This altitude is exactly that where the valuable trees of the Atlantic flora of the Canary Islands flourish, among them being the 'Til' (*Orotea* [*Oreodaphne*] *foetens*) which is one of the four laurels of those mountains, characterized by its berries which resemble in form the acorns of the English oak. The famous 'holy tree' of the island of Ferro, of which historians have given remarkable accounts, was undoubtedly a 'Til' which grew on a high peak where the fog of the trade winds was condensed, and the quantity of water collected under the historic tree was enough to form pools of drinking water to supply the need of the poor natives in a district where there were no springs. Everyone who has passed through the belt of mists in any parts of the Canaries covered by the well-known trees of the islands can have no doubt that this afforestation keeps the earth moist. Comparing these areas with others in the neighbourhood, which have been unfortunately cleared of trees by the axe of the woodman, the astonishing results obtained by Dr. Marloth with his two rain gauges on Table Mountain are clearly explained. It can easily be understood thus that there was nothing miraculous in the stories of trustworthy historians about the 'holy tree' of Ferro. This famous 'Til' grew at an altitude where the trade winds condensed the moisture in the clouds of the mist, and the tree was enabled to precipitate the beneficent water at a time when it did not rain.

It is just under the same conditions that at the Cape of Good Hope the water deposited by the mist reached in two months the almost fabulous height of 78 inches in the rain gauge designed to imitate a tree, and this enables us to understand perfectly and scientifically what history tells us of the 'holy tree'. This fact ought never to be forgotten in a campaign undertaken by the friends of trees. It is of importance to plant with forests all heights where it is known that clouds collect, in order to gather from them the water which they contain, and which otherwise would be uselessly lost.

GRENADA AGRICULTURAL DEPARTMENT.

A copy of the progress report on the work of the Agricultural Department, Grenada, for the quarter ended March 31, 1919, has been forwarded to this Office by Mr. J. C. Moore, the Superintendent of Agriculture. From this the following matters of interest are abstracted.

Details of work in the Botanic Gardens include results of experiments with yams, which did not come up to expectation as regards yield, in consequence of the unusually long spell of dry weather experienced in most localities in August and September, which checked the growth of the yams at a time when rain was needed, thus causing a comparatively poor yield. Results of experiments with five species of Crotalaria, with the object of testing their suitability for green-dressing or soil-covering crops, are also recorded. They all seemed suitable for green-dressing or soil-covering purposes, but preference is still given to *Canavalia ensiformis* for general purposes, while *Crotalaria juncea*, when sown thickly on clean tilled soil, seems well suited for quickly producing a dense mass of vegetable matter, at the rate of about 10 tons per acre, four months after sowing. *Crotalaria usumaroensis*, though grown close to the others, was the only species infested with red spider (*Tetranychus* sp.), but did not show any noticeable ill effects in consequence, beyond the characteristic spotting of the leaves. As usual, the dry season caused much extra work in the direction of watering plants, etc.

Plant and seed distribution for the quarter included coco nuts, 3,081; palms, 4,000; yams for plants, 4,780 lb.; grafted mangoes, 85; onions, 1⅞ lb. With the exception of seed coco-nuts and onion seed, which were imported on behalf of planters, the plants and seeds distributed were all grown at the Botanic Gardens.

Observations in connexion with work in the Experiment Plots emphasize the difficulty experienced in procuring labour when required, making it almost impossible to carry out suitable and timely operations under proper supervision.

The oldest lime trees at Morne Rouge are in a fairly satisfactory condition, no further cases of collar rot having occurred during the period under review. At St. Cyr Mountain the trees continue in the thriving condition that has been characteristic of their progress since they were planted in 1915. The results from this plot fully support the recommendations of the Superintendent of Agriculture from time to time, in regard to the soil and climatic conditions suitable for successful lime growing. On the other hand, the trees at Westerhall are subject to severe attacks of scale insects, and do not appear likely to thrive on this plot; while the Botanic Station lime plot continues to show marked irregularity in the progress of the trees.

A decrease in the numbers of thrips on cacao is reported, and it is believed that if the dry weather continues until the end of April, the damage to cacao trees from thrips attack will be comparatively mild during the 1919 season. Experiments with several washes for the control of black ants and mealy-bug on cacao trees were carried out at the Botanic Gardens in January by the Entomologist and the Superintendent of Agriculture. All the cleaned and sprayed cacao trees were found to be reinfected by the black ant when examined in March, two months later.

The ginning of Sea Island cotton has been begun, about 1,600 lb. of seed-cotton having been dealt with up to the end of March. There are indications that the total crop to be handled by the Ginnery will only approximate 1,500 lb. of lint.

This report indicates the usefulness of the work carried on by the officers of the Agricultural Department in many directions, which cannot fail to influence beneficially the future agricultural and industrial development of the colony.

At a meeting of the Board of Agriculture, British Guiana, held on April 11, 1919, Prof. J. B. Harrison, Director of Science and Agriculture, stated that the rubber cultivation in British Guiana, he was sorry to say, was in a very bad state, and he felt certain that in the present year there would be a further abandonment of land under rubber cultivation. That abandonment was due partly to the attack of rubber disease, but principally to the fact that it was impossible to get the labour to bleed the trees, and even if the necessary labour was obtained, it was only by the payment of too high wages. He was afraid that rubber cultivation in that colony was to be regarded as practically finished. (The *Daily Argosy*, Demerara, April 15, 1919.)

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†Provided by the Imperial Department of Scientific and Industrial Research.

Agricultural News

Vol. XVIII. SATURDAY, MAY 3, 1919. No. 444.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial is a continuation of the subject treated of in the previous issue.

On page 138 will be found an interesting article summarizing investigations as to the food of the mongoose in Trinidad.

A continuation of the article on lime cultivation in Dominica appears on page 142.

The improvements possible by the application of science to cacao production form the subject of an article on page 141.

Recent Plant Legislation in Grenada.

Attention has been drawn in recent issues of this Journal to legislation prohibiting the importation of citrus plants or parts of them into several of these islands, in order to guard against the introduction into them of diseases affecting citrus trees, especially lime trees.

A similar Proclamation dated April 1, 1919, has been issued in Grenada by the Governor of the Windward Islands, prohibiting the importation into that colony of citrus plants and parts of citrus plants, including their fruit, from any country or place other than the colonies of Dominica, Montserrat, and St. Lucia.

The exceptions above noted are made because those islands are known to be free from the dreaded 'blossom blight' or 'wither tip' disease of citrus trees, and because the lime cultivation in those islands is under the constant inspection of the officers of the agricultural departments.

Onion Growing in Dominica.

The following interesting note has been contributed by Mr. J. Jones, Agricultural Superintendent, Dominica:—

'With reference to the article on onion growing in Dominica, which appeared in the *Agricultural News*, No. 441, page 91, it may be stated that the experiments at Spring Hill have yielded further information on the important matter of the production of seed in the West Indies.

'It was noticed in the article referred to that Mr. Seignoret raised a large number of sets from Teneriffe onion seeds imported in November 1917. Numbers of these were successively planted from July to December 1918, the month of September excepted. While all did well, none showed any tendency to produce seed until December, when a considerable proportion did so, and the seeds are now ripening. It would appear that, after the sets are twelve months old from seed, the natural habit of the onion, which is a biennial, asserts itself, and there is a strong inclination to produce seed. It is practically certain that seed production is a matter of age of the bulb, and of season, and that once these have been determined, it should be possible to produce onion seeds in these islands regularly, and in sufficient quantities to meet local requirements.

'After seed production will come the matter of seed selection, and it is well known that, without selection, varieties of onions are very liable to deterioration.'

Phosphate in Barbuda.

On several occasions samples of rock from Barbuda have been analysed, and found to contain a considerable percentage of calcium phosphate.

A note has recently been received at the Imperial Department of Agriculture from Mr. A. E. Collens, Acting Government Chemist and Superintendent of Agriculture for the Leeward Islands, in which he gives the analysis of rock received from Barbuda at the Government Laboratory, Antigua. The analysis shows

that the rock is chiefly composed of calcium phosphate, 71·50 per cent., and calcium carbonate, 14·62 per cent., and that the mineral is a high grade phosphate, very suitable for the manufacture of superphosphate of lime. In this respect it differs considerably from the phosphate obtained from the neighbouring island of Redonda, which, though containing 30 per cent. phosphoric anhydride, is unsuitable for making superphosphate on account of its being in the form of aluminium phosphate. Dr. Tempany, when Superintendent of Agriculture for the Leeward Islands, published an analysis of the Redonda rock in the *West Indian Bulletin*, Vol. XV, p. 22.

In comparison with five or six commercial types of mineral phosphates, the percentage of tri-calcium phosphate contained in the Barbuda rock compares favourably with some of the best.

These deposits occur on the north-west side of the island, and it is said that some years ago mining was undertaken in one of the caves in the vicinity, but there does not appear to be any available record of the amount of the material shipped, or of the reason for abandoning the enterprise. As, however, these deposits occur at a spot more than 6 miles away from the shipping place in Barbuda, and as there are no roads across the island, while freightage by boats from the north-west coast is a risky operation, only possible in calm weather, it seems very probable that difficulty of transport was the real cause of the failure of the operations. Unless phosphate can be shipped easily and cheaply, it would hardly be a paying proposition to exploit it.

Clidemia hirta—A Noxious Weed in Fiji.

The introduction of uncultivated plants from one country to another, in the latter of which climatic and soil conditions may be specially suitable for their spread, is always a somewhat risky and perhaps dangerous proceeding. Many such plants become serious pests to the cultivation of their adopted country, and lead to much expense and trouble having to be undertaken for their control or eradication.

An example of this has lately been brought to the notice of the Imperial Commissioner of Agricultnre in a letter from the Fijian Government to the Government of British Guiana, and forwarded to the Imperial Department of Agriculture.

It appears that *Clidemia hirta*, one of the Melostomaceae, a common plant in British Guiana, and throughout the West Indies from Trinidad to Jamaica, has been introduced—it does not appear in what way—into Fiji, where it is now regarded as a noxious weed, and has become an agricultural pest, under the name 'Kösters Curse', although in its original habitats it is not considered as a weed of any importance.

The Government of Fiji are making anxious enquiries as to whether any means for checking its growth and spread are known or practised in its native habitats. At present no control has been thought necessary in the West Indies, and therefore no help can be afforded to Fiji in this direction.

Industrial Alcohol in Canada.

At a meeting of the Colonial Section of the Royal Society of Arts, March 4, 1919, which is reported in the Journal of the Society, March 21, 1919, an interesting paper was read on Science and Industry in Canada, by Prof. John Cunningham McLennan, in which he notes some interesting developments that have taken place with regard to the production of alcohol in Canada in recent years. The Prohibition Act has led to the result that all the distilleries are now directing their attention to the production of alcohol for industrial purposes. At present, alcohol is being made from grain, molasses, and potatoes. This, it is evident, involves a great waste of valuable food products, and, as the molasses is all imported from abroad, the industry from a national point of view is not economically sound. The Advisory Council on Scientific and Industrial Research is directing attention to the matter, and an attempt will probably soon be made to utilize the sawdust and wood waste of British Columbia, Ontario, and Quebec, as well as the waste sulphite liquor from the pulp mills of those Provinces, for the production of alcohol in considerable quantities for industrial purposes.

The Snake Gourd.

Some seeds of the snake gourd (*Trichosanthes anguina*) have been recently received at this Office from Mr. T. Jackson, Curator of the Botanic Garden, Antigua. This is a variety of gourd grown in Ceylon to a very great extent, and much appreciated and largely used as a vegetable. Mr. Collens, Superintendent of Agriculture, Leeward Islands, also bears testimony to its palatableness as grown in Antigua.

A note in the *Tropical Agriculturist*, January 1919, on the cultivation of this and other gourds, gives the following directions. Dig holes 2 feet by 2 feet and fill them up with a mixture of loamy soil, well rotted pen manure, and a little lime. It is well to plant three or four seeds in each hole, and later on to thin out to one—the best plant. The plant should be watered freely, and should have strong supports to climb on.

When the fruits are a few inches long, small stones or light weights should be hung at the ends of the fruits to prevent them becoming knotty or spiral. The fruits grow to a length of 5, 6 or 7 feet, although there is a shorter and heavier variety which does not grow longer than 2½ or 3 feet. The full development of the fruits is hindered either by very wet or very dry weather. For eating, the fruits should be plucked before they mature, because as they ripen, the interior of the gourds becomes fibrous. It is said that under favourable conditions in Ceylon, 20,000 fruits may be reaped from an acre, if the plants are grown 8 feet apart.

It would appear as if this gourd might be a valuable addition to the list of vegetables cultivated in these islands, seeing that it is grown successfully in Antigua at least.

THE FOOD OF THE MONGOOSE IN TRINIDAD.

In a recent number of the *Bulletin of the Department of Agriculture, Trinidad and Tobago* (Vol. XVII, part 4, p. 167, there appears an article under the above title by Mr. C. B. Williams, M.A., F.E.S., Entomologist-in-Charge of Froghopper Investigations.

This article records the examination of 180 stomachs of mongoose taken throughout a period of one year, and affords much more information on this important subject than has been available hitherto.

In the introduction the author mentions that the question has been frequently raised as to the responsibility of the mongoose for the prevalence of the froghopper which has been a serious pest of sugar-cane in Trinidad.

An article on rats and mongoose in the West Indies appeared in the *Agricultural News*, November 2, 1918. In this it was shown that in certain of the West Indian islands the mongoose is held to be largely responsible for the outbreak of certain insects as pests of crops, owing to its action in killing large numbers of beneficial forms of animal life.

Mr. Williams refers to the need which he found of information as to these matters, and the absence of any sufficiently accurate work on the subject on which to base conclusions. Consequently, in order to provide the necessary information, dissections of mongoose stomachs were begun in October 1917, and carried on as fully as possible until September 1918. In all, 180 stomachs were examined, of which fourteen were empty. Of the remaining 166, eighty-five were obtained in the dry season (February to May), and eighty-one in the wet season (June to January)—January 1918 was exceptionally wet.

The information obtained has provided a basis for comparing the good done by the mongoose, and the harm that may be charged against it. After a list giving a detailed analysis of the contents of each of the stomachs examined, with remarks on the various foods contained in them, the writer summarizes on the one hand the damage, and on the other, the good that may be attributed to the mongoose, as follows:—

'Credit: Twenty-eight rats, about 600 injurious insects and three crabs.

'Debit: Twenty-six birds, seventeen lizards, twenty-nine frogs and toads, forty-four useful insects, and forty-four spiders.

'From the above it is possible to draw certain conclusions of which the following are perhaps the most important:—

'(i) The mongoose is neither entirely harmful, nor on the other hand, entirely beneficial.

'(ii) The damage done to wild birds is probably completely offset by the number of rats destroyed, which would themselves have destroyed many of the tree-living birds which the mongoose cannot reach.

'(iii) The destruction of lizards, frogs, and toads is only partly offset by the numbers of injurious insects destroyed, and there is little doubt that the presence of the mongoose in large numbers in a district will in this way have an unwelcome effect on the numbers of insects present.

'(iv) The complete extermination of the mongoose would probably lead to a recrudescence of the damage caused by rats, which, in some countries, is a serious item.'

The variations of food, according to season and locality, are set out in a table, the information in which is summarized as follows:—

Locality.—'(i) Twenty-two rats were found in 118 stomachs on the sugar estates as compared with three in forty-eight stomachs in the cacao districts. This may be due to there being a greater number of rats in the sugar district, but greater facilities for escape afforded to the rats by the trees in the cacao districts will also affect the result.

'(ii) The total number of birds is relatively higher in the cacao districts, but this is entirely due to the greater number of domestic fowls, which are much commoner round the numerous small houses of the cacao planter than on the sugar estates.

'(iii) The number of frogs and toads destroyed is relatively much larger in the sugar than in the cacao districts.

'(iv) The number of snakes destroyed is relatively higher in the cacao districts'.

Season.—'(i) The number of rats destroyed was more than twice as great in the dry season as in the wet.

(ii) The number of snakes destroyed was more than three times as great in the wet season as in the dry season.

(iii) The number of frogs and toads destroyed was nearly twice as great in the wet season as in the dry.

(iv) The number of adult Lamellicorn beetles (including "hardbacks") was more than three times as great in the wet season as in the dry. This is easily explained by the fact that most of these hatch out in the wet season. On the other hand, the number of Carabid larvae was greater in the dry season.

'(v) The number of spiders destroyed was greater in the wet season.

'(vi) Of the sixteen centipedes destroyed, only one was taken in the dry season, and that one in February after a wet January.'

A comparison is given of the food of the mongoose in the northern and in the southern districts. In the northern district this animal has been established and widely distributed for many years, but it has only recently invaded the southern part of the island.

It was held that if the mongoose during its residence in the island had had any effect on the relative numbers of the animals on which it preys it might be possible to trace such an effect by a comparison of its food in the district where it has been established for many years with those into which it has but recently spread.

The comparison has therefore been made of the contents of thirty-six stomachs of mongoose killed in the northern districts with those of forty stomachs obtained from the south.

An inspection of the analysis of the stomach contents shows the following points of interest:—

'(i) The number of rats destroyed is much larger in the southern (newly infested) district than in the northern.

'No other explanation of this appears to be possible but that the long presence of the mongoose in the northern districts has reduced the number of rats available for food.

'(ii) The number of birds destroyed is greater in the southern district: in fact no birds were found in the stomachs of mongoose taken at Caroni.

'It must be noted in this connexion that Caroni estate in the north is a large flat area very bare of trees and bush. The southern estates are more broken up by other cultivation, and have in general a greater number of trees. Allowing for this, it is still possible that the figures indicate that the number of birds in the northern district has been reduced by the mongoose.

'(iii) The number of lizards and snakes is slightly greater in the northern district than in the southern.

'Although the excess is not great, yet it is entirely contradictory to what would be expected, if the mongoose is the chief factor in the supposed reduction in the number of lizards in recent years.

'(iv) The number of frogs and toads destroyed is greater in the north than in the south.

'As with the last section, these figures scarcely support the idea that the mongoose has been the cause of the extermination of these animals in the district where it has been long established. The results must be qualified, however, by the fact that the flat low-lying nature of the Caroni district gives rise to a greater amount of standing water, and suitable breeding places for frogs and toads. In spite of any long-continued destruction, there still seems to be a sufficient number in the north to form quite a large proportion of the food of the mongoose.

'(v) Ten predaceous beetle grubs were found in the stomachs of the mongoose from the southern district, while none were found in those from the north.

'Although probably significant, it is doubtful if any conclusion of practical importance could be drawn from the figures. Too little is known of the habits of these insects.

'(vi) A much larger number of both spiders and centipedes were found in the stomachs from the northern section.

'The general remarks under (iv) and (v) apply here also. There appears to be no evidence that the mongoose has created any unusual scarcity of these animals in the districts that it has inhabited for many years.'

The following general conclusions are expressed, together with the thanks of the writer for the assistance rendered by various planters in obtaining the necessary stomachs for examination, and to Mr. F.W. Urich for his help with regard to some of the identifications of the stomach contents:—

'Although the results obtained from the comparison of the food in the northern and southern districts are somewhat contradictory, it is probable that the conclusions given above are more or less justified, and that the presence of the mongoose, except in limited numbers, on an estate in Trinidad, is undesirable. Special conditions in other localities (such as poisonous snakes or very severe damage from rats) might cause the balance to be in its favour, but even in these cases it should be possible to find some less risky method of control.

'The present method of paying one shilling per head seems to meet the conditions, and as it will automatically cease to act whenever they become too scarce to make their capture a paying business, it is not likely to be carried to the point of extermination.

'Although there is good evidence that in the early days of its introduction into Jamaica it greatly reduced the number of rats, which were an extremely serious pest, there is no doubt that the mongoose should not be introduced into any country where it does not now exist. Perhaps the most unfortunate introduction up to the present has been into British Guiana, whence it may in time spread through the whole of continental America. It has here ceased to be a local problem, as in the smaller islands, but one that concerns all the neighbouring countries, and specially severe methods should be adopted to prevent its spread.

'Finally, it is suggested to those in a position to carry it out, that the food of the mongoose be now investigated in India to see if there has been any change in its diet since its introduction into the West Indies. It is hardly too much to say that many thousands of pounds and many years of worry would have been saved to the planters in this part of the world if this had been undertaken, not now, but *before* the mongoose was introduced, almost fifty years ago.'

H. A. P.

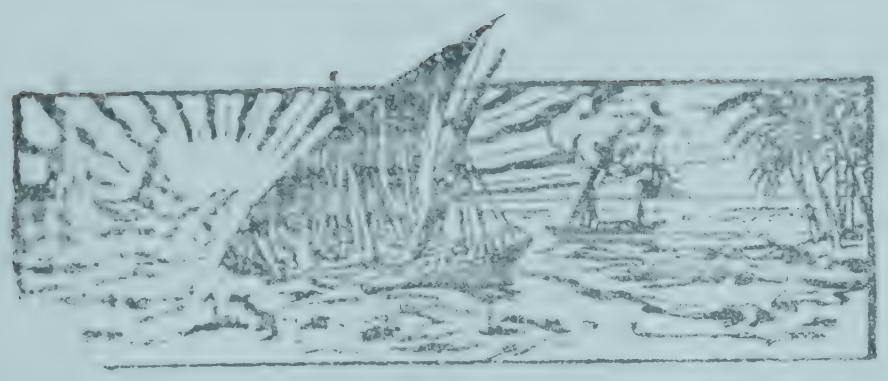
WASTAGE OF GREEN LIMES IN SHIPMENT.

In a letter to the Imperial Commissioner of Agriculture for the West Indies, Mr. J. Jones, Agricultural Superintendent, Dominica, draws attention to the considerable amount of wastage which occurs in green limes shipped from that island to the New York market. Apart from the question of rough handling of the limes, he considers that the condition of some of the packing houses is such as to cause a very serious wastage even in the case of most carefully picked fruit. It would appear that most of the places used for 'quailing,' i.e. curing, and packing limes, are in the first place much too small for the purpose. Again, instead of tiers of shelves for curing the fruit being provided, there is no other accommodation than the floor, on which the limes are placed in heaps from which the fruits are selected for packing. The rejected fruit is often allowed to remain on the floor until the limes begin to arrive for the next shipment, and even longer than that. Owing to these conditions it would seem likely that many of these packing rooms must be infested with millions of germs which are capable of starting decay, and this alone must be a cause of a considerable proportion of the wastage now observed.

In reference to this matter, Mr. W. Nowell, Mycologist on the staff of the Imperial Department of Agriculture, states that for exact advice on the point it would be necessary to know what the rots are which affect the packed fruit, and especially to discriminate between Diplodia and the Penicilliums. With regard to general advice, Mr. Nowell suggests that a card suitable for hanging up should be printed with some elementary maxims, and distributed to packers in order to prevent their forgetting.

Mr. Nowell goes on to say that obviously all rejected fruit should be removed once a day. All injured fruits should be rejected in packing. Uninjured fruit is not attacked by Penicillium, even though covered with spores, under any ordinary condition. Diplodia attacks the stem-end even of uninjured fruit. 'Quailing' or curing is condemned by the United States authorities, and the alleged grounds for its adoption are not valid. Dry sound fruit should travel without rotting, provided that injured fruit is not included in the same package. Injuries may consist of pricks, cuts, and bruises, caused by dumping or rough handling. If stem-end rots are troublesome they can be stopped by a coating of shellac, as noted in the *Agricultural News*, Vol. XVII, p.94. Packing houses should be light and airy (not tightly closed at night but always well ventilated). If they are kept clean, and have no collection of permanent dust, are frequently whitewashed, the tables scrubbed, etc., spraying with fungicides is not necessary; if they are not, spraying will not cure the trouble though it may diminish it. For actual disinfection of fruit, copper sulphate 1:5,000 is best and cheapest, but washing of any kind is not to be recommended. For spraying rooms, one of the ordinary commercial disinfectants would be most likely to serve the purpose. Hycol, with molasses, is used with great success for laying dust and killing spores in the South African mines (see Report on the Department of Agriculture, South Africa, 1912-13, p. 180).

As will be seen from the above, Mr. Nowell attaches much importance to general cleanliness and methods of sanitation. In fact this is another instance of the truth of the adage that prevention is better than cure. It is far better and easier to prevent the rots than to cure them when once they have started attacking the fruit.



GLEANINGS.

The Board of Agriculture, Trinidad and Tobago, is offering prizes to the value of $245 for the encouragement of good cultivation of cacao and vegetables by the peasant proprietors and contractors of Tobago. (The *Port-of-Spain Gazette*, April 19, 1919.)

According to the Demerara *Daily Argosy*, April 15, 1919, the Board of Agriculture has just made an order prohibiting the importation of seeds, plants, earth, etc. from Trinidad, this prohibition being made on account of the presence of the froghopper pest in that island.

The *Port-of-Spain Gazette*, April 18, 1919, says that it may not be generally known that the total expenditure of the Department of Agriculture is about £20,000 per annum, the revenue being about £12,000, making the total cost to the colony about £8,000 a year for gardens, farms, laboratory, experimental stations, and the two Government estates.

According to *Sugar*, April 1919, great interest is being taken in the extension of sugar-cane cultivation in South Florida. It is contended that with modern methods of culture and production, the South Florida lands would yield as much sugar per acre as those of Cuba, but that large centrals and plantations are the only possible solution of the South Florida sugar problem, as the day of small mills is passed except for the making of syrup.

A leaflet dated February 4, 1919, issued by the Department of Land Records and Agriculture, Assam, states that, on the average of the five years ending 1916-17, the area under cotton in Assam represents about 0·2 per cent. of the total area under cotton in India. The total outturn of the present crop of clean cotton, from an estimated area of 33,000 acres, amounts to 12,000 bales as against 13,000 bales last year. The decrease is due to excessive rain in August and September.

At a meeting of the Board of Agriculture, Trinidad, January 16, 1919, Mr. W. G. Freeman, the Acting Director of Agriculture, briefly reviewed the work at River estate in replacing poor-bearing cacao trees by budding. He stated that it was very encouraging to find from recent reports that almost identical work had been done on a large scale in California on orange trees, with uniformly successful results. As in the case of the River estate experiment, the Californian work was based on the records of the crops of individual trees over a number of years.

Reports from Java complain of prolonged drought, and that at the time when the rainy season is already due. The area planted with cane in that island has decreased by 15 per cent., in fact it came down from 399,681 acres to 338,654, as a consequence of the difficulties in the transport of the sugar of the crop of 1917. The sugar crop of that year was about 1,800,000 tons, the biggest ever made in the island. (The *Louisiana Planter*, March 29, 1919.)

The Board of Agriculture, Trinidad, at a meeting held on February 7, 1919, decided that the following recommendation of the Sugar Committee of the Board, with reference to the Dutch colour standards for sugar, be communicated to the Government of Canada: 'Owing to the arbitrary character of the Dutch standards which are an obsolete survival from the days before the polariscope was available, steps should be taken to secure their abolition, and the substitution for them of a polarization test only.'

In an article on San Domingo sugar-cane, the *Louisiana Planter*, March 29, 1919, says that some day the Republic of San Domingo will be developed, as Porto Rico is being developed now, and will become an important factor in supplying America with sugar. The San Domingo cane crop has been constantly increasing in recent years, the estimate for this year reaching 175,000 long tons of sugar. To this may be added another 18,000 tons from the western Republic of Haiti, making a total of nearly 200,000 tons of sugar from the whole island, which was originally called Hispaniola, the first settlement of the Spaniards in the Western Hemisphere.

In the West Indian Notes in *The Times* Trade Supplement, March 29, 1919, it is stated that Jamaica rum is to provide more revenue for the Government of the island. A bill to levy a surtax of 10 per cent. extra duty on the commodity has just been introduced in the Legislative Council, and rum duty on the higher scale is already being collected. At present Jamaica is sending to the United Kingdom a record cargo of rum. It was purchased by parties in Great Britain, and has been stored for the past four years in the bonding warhouses of the island. A steamer in Kingston harbour has loaded 8,000 puncheons, the largest cargo of rum ever sent from Jamaica in one vessel.

The Board of Trade Journal, March 20, 1919, states that according to the Annual Report on the Administration of Hyderabad for 1916-17, the Agricultral Department in that State was chiefly occupied with the improvement of cotton, and the restoration of the indigenous long staple cotton which was being displaced by the short staple variety imported from the British Provinces. Arrangements were made with the Bombay mill owners to purchase unginned cotton of this type at a higher price than that ruling for mixed. The arrangement was not however an entire success, as the long staple cotton did not fetch the premium over short staple anticipated by the Department. The Government, however, are determined to continue the experiment for a further period, the Hyderabad long staple being now classed under a distinct head amongst Indian cottons.

SCIENCE IN CACAO PRODUCTION.

An interesting article by Mr. A. W. Knapp, taken from the *Journal of the Society of Chemical Industry*, appears in the *Port-of-Spain Gazette*, April 6, 1919. Much of this article is reproduced below.

There is a great field for the application of physical and chemical knowledge to the production of the raw materials of the tropics. In one or two instances notable advances have been made. Thus the direct production of a white sugar (as now practised in Java) at the tropical factory will have far-reaching effects, but with many tropical products the methods practised are as ancient as they are haphazard. Like all methods founded on long experience, they suit the environment and the temperament of the people who use them, so that the work of the scientist in introducing improvements requires intimate knowledge of the conditions, if his suggestions are to be adopted. The various Departments of Agriculture are doing splendid pioneer work, but the full harvest of their sowing will not be reaped until the number of tropically educated agriculturists has been increased by the founding of three or four agricultural colleges and research laboratories in equatorial regions.

As an illustration of the above generalization of the many ways in which science may be expected to improve the production of tropical products, the cacao industry is adduced. In the first place, improvement of yield should be kept in view. At the present time the average yield per tree is surprisingly small, being about 1½ lb. to 2 lb. a year, and the total world production is about 290,000 tons a year. By scientific agriculture, taking a conservative estimate, the average yield per tree could be raised to 6lb., and the total production to over a million tons a year.

Improvement also in methods of harvesting the crop is to be sought for. The pods are cut from the tree by knives on the end of poles, a difficult operation. Considerable ingenuity has been exercised to produce a gatherer which will sever the pod stems and yet be 'fool-proof,' but the ideal method of collecting has yet to be found.

The pods have to be cut open after they are picked, and the juicy beans removed. This is generally done with a cutlass. What is needed is a knife which will cut the husk of the pod without injuring the beans within. The placenta (the part of a plant to which the seeds are attached) contains a fair percentage of pectin, of which no use is made.

Many questions with regard to the preparation of the cacao for the market need scientific investigation. The question of fermentation, in the first place, and how this is best to be accomplished needs much consideration.

The seeds or beans are covered with a juicy pulp and would rot if they were not dried. The best way to remove the pulp is to allow it to ferment; this occurs naturally on exposure to air, as with grape juice. The effects of fermentation are varied and all advantageous—the bean becomes more easy to dry, and on drying becomes crisp; it develops a richer colour, and on roasting, a firmer aroma and flavour. Fermented cacao always fetches a higher price than unfermented cacao from the same place, but fermentation is by no means universally practised. Hence one finds on the market considerable quantities of cacao which contain mouldy beans, for unfermented cacao readily gets mouldy; this is a serious loss to the world. Fermentation is not carried on anywhere in a scientific manner; everywhere the cacao is at the mercy of the chance organisms in the air. The quality of the cacao produced varies, and the quality is reflected in the prices obtained; thus the Food Controller has fixed the price of British West African cacao at 65*s*. a cwt., Grenada at 85*s*. a cwt., and Ceylon at 100*s*. a cwt. The quality of any cacao is the result of the botanic variety or 'breed' plus the treatment it receives in preparation for the market. Now Grenada and Ceylon cacaos are obviously different in 'breed', so that Grenada cannot hope by fermentation, however scientific, to get the Ceylon bean. The line of improvement perhaps for Grenada is to try the planting and rearing of the more delicate Ceylon type of cacao. Grenada beans are very carefully prepared (if not scientifically, yet with great art) and give practically 100 per cent. perfect beans. This is the explanation of the higher prices given for Grenada cacao over that from West Africa.

No entirely satisfactory theory of the changes in cacao due to fermentation has yet been established. It is known that the sugary pulp outside the beans ferments in a similar way to other fruit pulp, save that for yeast fementation the temperature rises usually high (in three days to 47° C.); and also that there are parallel and more important changes in the interior of the bean.

But there is still a vast amount of work to be done before the chemist will be in a position to obtain the more desirable aromas and flavours. Having found the necessary conditions, scientifically trained overseers will be required to carry them out, and for this they will need to have under their direction arrangements for fermentation designed on correct principles, and allowing some degree of control.

It is not always remembered that the beans and pulp contain tannic and acetic acids. As the present overseers generally have no knowledge of chemistry, they do not understand, for instance, how the appearance of the cacao may be spoiled by the iron nails used in constructing the fermentation boxes, when acted on by those acids.

This leads to the question of the use of the juice which runs to waste, and it cannot be less than eight million gallons a year. This juice or 'sweating' contains about 15 per cent. of solids, about half of which consists of sugars. If the fermentation of the cacao were centralized in the various districts, and conducted on a large scale under a chemist's control, the sugars could be obtained, or an alcoholic liquid, or a vinegar could easily be prepared. This acid liquid might also be used for the coagulation of rubber latex.

Drying is the only point in cacao production which has received much attention from the engineer. Whether the cacao has been fermented or not, it has to be dried to prevent it going mouldy. The common practice is to spread it on platforms or mats, and dry it in the sun. In a few places where sun-drying is difficult, drying machines are slowy coming into vogue, and doubtless the general principles of drying are well understood, but to make a really satisfactory drying machine one must have knowledge of the chemical and physical nature of the raw product.

It has been pointed out by several observers that during sun-drying the changes due to fermentation continue, particularly the change due to an oxide, i.e. the oxidation of a tannin which results in the removal of the astringent taste, and the development of a brown colour. With drying machines the conditions are often unfavourable to this action. This is one of the reasons why, at present, manufacturers of cocoa somewhat prefer the sun-dried to the machine-dried beans.

Criticism could be made of the various subsidiary processes (washing, claying, polishing, etc.) to which the beans are subjected in different countries, but sufficient has been said to give an idea of the wide field for research, and of the opportunities for the application of known facts to this industry.

PLANT DISEASES.

THE SUSCEPTIBILITY OF RUTACEOUS PLANTS TO CITRUS CANKER.

Some important data of the results of field observations and inoculations with citrus canker (*Pseudomonas citri*) upon plants belonging to genera more or less related to citrus are given in a paper published in the *Journal of Agricultural Research*, Vol. XV, No. 12. The author, Mr. H. Atherton Lee, Assistant Pathologist, Bureau of Plant Industry, United States Department of Agriculture, shows from these observations that a wide range of hosts exists for citrus canker, and that the possibility of lesions upon plants other than *Citrus* spp. serving as sources of new infection becomes emphasized in the work of citrus canker eradication.

Over 2,000 inoculations were made in the course of the investigation on twenty-four species representing twenty genera of the Rutaceae. In making the inoculations, an infusion of the citrus canker organism was painted upon the leaf blade, midrib, petiole, or stem, as the case might be, with a small camel's hair brush, and then the tissues was punctured through the coating of infusion with a needle. The inoculated twig was maintained in a moist condition by wrapping it in parafin paper containing a small piece of moistened cotton.

The investigations were carried on largely at the Lamao Experiment Station of the Philippine Bureau of Agriculture. Many of the plants studied, related to citrus, grow wild in the Philippine Islands. It may be noticed that two of the plants investigated are widely known in these West Indian islands, namely *Murraya* (Chalcas) *exotica*, grown as an ornamental shrub, and locally called 'citronella', and *Triphasia trifoliata* one of the best hedge plants in these islands, locally called 'sweet or myrtle lime'. Another genus experimented with (Xanthoxylum) has several West Indian representatives, although the special species investigated does not occur in these islands. The investigations show that these West Indian species possess immunity to citrus canker. This immunity possibly arises from the fact that the species referred to possess thick, coriaceous, brittle leaves, which suggests the possibility that resistance to citrus canker may be influenced in some measure by histological or morphological differences.

The results of the investigation may be summarized as follows: that inoculation tests with citrus canker (*Pseudomnas citri*) upon twenty-four species representing twenty genera of the order Rutaceae show that nineteen of the species are susceptible in a greater or less degree. It thus appears that citrus canker is not limited to the genus Citrus, but has a wide range of hosts among the Rutaceae. The abundance of cankers occurring naturally on some of the native Rutaceae of the Philippines and South China gives rise to the theory that one or other of them may have been an original wild host from which citrus canker spread to cultivated species.

LIME CULTIVATION IN DOMINICA.

(Continued.)

III. BUDDING OF LIMES, PROPAGATION BY LAYERING AND PRUNING.

The following continues Mr. J. Jones's report on his experiments with lime trees at the Experiment Station, Dominica. The first part of this report will be found in the two previous issues of this Journal:—

Budding of limes. In recent annual reports reference was made on two occasions to the experiments now being carried on with limes budded on the sour orange, citron, and M'gergeb stocks, the last named being a variety of citron received from Algeria, where it is used as a stock for oranges.

Experience has shown that, while lime trees are blown over by thousands during the occurrence of hurricanes, the sour orange and sweet orange trees, if growing on fairly deep soils, are never uprooted under like circumstances. This led to these experiments being made in the budding of limes, the chief object of which is to test the root-holding power of the sour orange when carrying a lime top, which, in the case of a well grown tree, is much larger and heavier than an orange top. Many years may elapse before the budded plants are put to test. In the meantime the planting of this class of plants will probably be continued on a small scale. It is important to remember that budded plants should always be placed out in soils of a good depth, in order that the tap root may be allowed to develop. The object aimed at would be nullified by planting on shallow soils overlying a hard subsoil.

It is also known that several thousands of sweet orange trees grown upon the sour orange stocks in a forest district have proved immune from the root diseases which cause a considerable loss of trees amongst lime cultivations in newly cleared areas. If this immunity continues, the loss of lime trees which now occurs under these conditions would be prevented by using the sour orange as a stock.

The trials now being made with limes worked upon sour orange stocks are sufficiently advanced, both on estates and at the Experiment Station, to show that under careful cultivation the plants will attain to a good size in four years. Like all budded citrus plants, progress is slow during the first year after planting in the field. Fair growth is made in course of the second year, and during the third and fourth years the rate of progress is excellent, especially so when green dressings are used, and shelter afforded.

Should the budded limes come successful through the root-holding trials, whenever Nature may impose the test, it is probable that this class of plant will appeal to planters who like to do things well, and who posess the capital to carry out their ideas. That seedling limes will continue to be largely used is certain, owing to their cheapness, and to the fact that though easily overturned during storms, they can be renewed by suckers within two or three years, and that once renewed by suckers they are not likely to be again disturbed, as far as the roots are concerned.

Should the budded plants in due course prove able to resist the high winds, and accomplish all that is wished of them, it would have to be admitted that the grower of seedling limes, in spite of initial cheapness, has to pay in the end a much higher rate, in order to secure immunity from uprooting, than the purchaser of budded limes. But it may be argued that many planters are better able to meet this cost when in possession of an established though damaged property, than they were to pay for the high cost of budded stock at the commencement of planting operations.

The experiment already made shows that limes will grow well upon sour orange stocks. With regard to citron and M'gergeb stocks, the results are in doubt. Up to two years after planting very poor growth has been made by the first named. Growth on the M'gergeb stock has been better, but it gives no promise yet of being so suitable a stock for limes as the sour orange.

Propagation by layering. Some years ago a few experiments were made on coast estates in the propagation of limes by layering. The method usually followed is to remove a ring of bark from the stem of a selected branch, and then to place a few handfuls of moss over and above the wound, the moss being held in position on the stem by sacking, or bound by wide bands of vegetable material such as the sheathing cases of leaves of *Musa textilis* and the dry leaves of the Pandanads; or by dividing a bamboo pot and then placing it in position and filling with either moss or earth. If the moss or soil is kept wetted, roots are emitted in due course. When strongly rooted, which usually results in two or three months, according to the season of the year and the amount of attention given, branches may be severed and planted out. This method of propagation cannot be recommended for the drier coast districts of Dominica. It is troublesome, costly, and slow, and such plants after being planted in dry localities tend in their young state to produce flowers and fruits, a weakening process, instead of the free growth, or strengthening process, which is needed. When in this stage they are apt to fall victims to attacks of scale insects. The efforts to overcome these attacks by pulling off the successive flushes of flowers, and the need of applications of nitrogenous manures to promote a free growth have resulted in this form of propagation being ruled out under the conditions mentioned. Dependence is rightly placed on healthy seedlings, which can be raised in quantities both easily and cheaply.

This matter, however, presents another aspect in the case of lime growing in wet districts. Under moist climatic conditions the lime branches emit roots readily, the daily attention which is required in a drier climate is not necessary; hence progagation proceeds more quickly and at less expense. As it is probable, but not yet fully proved, that the lime tree will not be as long-lived under the wet climatic conditions of the interior lands as it is under the drier climate of the coast zone, a method of propagation which is likely to result in early production of fruit is worth a careful trial. In such experiments care should be taken only to propagate from young, healthy, bearing trees.

An experiment with plants raised by layering is now being tried on Neba estate, which is located in a district having a considerable rainfall. The rooted cuttings are said to grow vigorously in their early stages, and to yield early. A few plants have also been placed out at the Experiment Station, in order that their behaviour under coast conditions may be closely observed.

Pruning. In the early years of a healthy lime plantation very little is needed in the way of pruning, the chief requirements being the keeping down of suckers, and the pruning away of the lower branches in order to keep an open space between the branches and the ground. As time goes on, more pruning is required, owing to injury to the branches by wind, to attacks of scale insects, and to the effects of plant diseases.

Young lime trees when badly pruned, which is, unfortunately, usually the case, possess great powers of recovery, and what are very bad wounds are sometimes callussed over at this stage. As the trees become older, this power of recovery diminishes, and unless pruning is properly done, the tree cannot cover the wounds with new bark. The wood in the majority of instances then decays, and if the injury is near the base of the trunk, the tree is doomed, although several years may elapse before death supervenes.

There is urgent need of greater attention being paid to pruning in plantations, in order both to lengthen the life of the trees, and to put an end to the unworkmanlike proceedings, which at present are the cause of great losses to planters.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S, has forwarded the following report on the London drug and spice markets for the month of March 1919:—

There has been but little or no change in the condition of the London drug and spice markets during the month of March from those recorded for the previous month. Buyers continue to be satisfied with small purchases sufficient to meet their immediate requirements.

GINGER.

At auction on the 6th of the month ginger was in fair supply washed rough Cochin fetching from 85*s.* to 90*s.* On the 20th of the month 346 bags of Japanese were offered, and 170 sold without reserve at 30*s.* per cwt. A week later some 300 bags of Cochin were disposed of without reserve at from 34*s.* to 38$ for medium and small washed rough.

SARSAPARILLA.

This drug was in good supply at auction on the 13th when the offerings amounted to 50 bales of grey Jamaica, 44 of Lima-Jamaica. 42 of native Jamaica, and 26 of Mexican. The only sales effected were 3 bales of the Lima-Jamaica, which realized 2*s.* 6*d.* per ℔. for part chumpy and mouldy; 3*s.* 6*d.* to 3*s.* 8*d.* were the prices asked for the grey Jamaica but no buyers were found. The native Jamaica was bought in at a nominal figure.

LIME JUICE, PIMENTO, CASHEW NUTS, ARROWROOT, CASSIA FISTULA, KOLA, CITRIC ACID, TAMARINDS, ANNATTO.

Large arrivals of lime juice were reported in the early part of the month, good pale raw West Indian being quoted at 3*s.* per gallon. Pimento has been in abundant supply ranging from 3¾*d.* to 4*d.* per ℔. Cashew nuts were also in abundant supply at auction on the 13th of the month when 122 packages were offered, none of which found buyers. The stocks of arrowroot on hand at the beginning of the month were reported to be very heavy, so that a fall in price was anticipated. At auction on the 20th of the month 10 kegs of Bermuda were offered and bought in at 5*s.* per ℔., and a week later fair manufacturing St. Vincent was to be obtained at 7*d.* to 8*d.* per ℔. Towards the end of the month Cassia Fistula was reported to be scarce and dearer, owners asking as much as 160*s.* for fair quality pods. On the 13th of the month kola was represented by 122 packages of West Indian, 12 of which sold at 7½*d.* per ℔., and one lot at 8½*d.* Citric acid has been in small demand at 4*s.* 6*d.* per ℔.; an increased demand is expected shortly when an improvement in quality is also looked for. A good supply of West Indian tamarinds was brought forward on the 13th of the month by 98 packages but no sales were effected. At thes ame auction 60 packages of Annatto seed were also offered but failed to find buyers.

MARKET REPORTS.

London.—The West India Committee Circular, March 20.

Balata—Venezuelan Block, 3*s.* 3½*d.* to 3*s.* 4*d.*; Sheet, 4*s.* to 4*s.* 1*d.*
Beeswax—No quotations.
Cacao—No quotations.
Copra—£37 to £37 10*s.*
Honey—West Indian, no quotations.
Lime Juice—Raw, 2*s.* 9*d.* to 3*s.* 6*d.*; Concentrated, no quotations.
Pimento—No quotations.
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, March 24, 1919.

Bay Oil—Lower, at 13*s.* to 14*s.*
Lime Oil—Slow, at 4*s.* 9*d.* for West Indian distilled, and 13*s.* for hand-pressed.
Orange Oil—West Indian, 7*s.* 6*d.* per lb.

Barbados.—Messrs. T. S. Garraway & Co., April 15.

Arrowroot—$8·75 per 100 lb.
Cacao—$19·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—No quotations.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—Dark Crystals, $5·50.

Trinidad.—Messrs. Gordon, Grant & Co., April 2.

Cacao—Venezuelan, $17·75 to $18·30; Trinidad, $17·00 to $19·00.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 18c. per lb..
Copra—$3·50 per 100 lb.
Dhal—No quotations.
Onions—$10·00 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $4·00 per 100 lb.
Rice—Yellow, $14·00; White, $9·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs Gillespie Bros & Co., April

Cacao—Caracas, 18c.; Grenada, 17c. to 17½c.; Trinidad, 18c. to 18½c.; Jamaica, 14½c. to 15½c.
Coco-nuts—Jamaica selects, $62·00; Trinidad $62·00 culls, $40·00 to $41·00 per M.
Coffee—Jamaica, 17½c. to 20½c. per lb.
Ginger—15c. to 17½c. per lb.
Goat Skins—Jamaica $1·10; Antigua and Barbados, 90c. to 95c.; St. Thomas and St. Kitts, 90c. to 95c.
Grape Fruit—Jamaica, $3·00 to $3·50.
Limes—Nominal $6·00 to $7·50.
Mace—36c. to 38c. per lb.
Nutmegs—21c. to 26c.
Oranges—$3·00 to $3·25.
Pimento—7½c. to 8c. per lb.
Sugar—Centrifugals, 96°, 6·90c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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CONTENTS

	PAGE.		PAGE.
Agriculture in Barbados	149	Industry, Modern Methods of Changes in ...	153
Book shelf	159	Insect Notes:—	
Coco-nut Products in the Philippines ..	150	Chinch Bug Fungus...	154
Cotton:—		Mahoe Cochon Tree in Relation to Cotton Stainer Control in St. Vincent	154
Cotton Growing in Venezuela	150	Items of Local Interest...	150
Sea Island Cotton Market	150	Lime Cultivation in Dominica	158
Cotton Stainer in Montserrat, Destruction of Food Plants of...	153	Market Reports	160
Cuban Sugar Industry—Past and Present ...	148	Notes and Comments...	152
Department News ...	151	Pine-Apples and Tomatoes in the Bahamas	147
English Chamber of Horticulture	153	Plant Pathology, Other Aspects of, ...	145
Gleanings	156	Weeds, New Machine for Exterminating	153
Guinea Corn, Hydrocyanic Acid Content of ...	151	Wormseed Oil	152
Implemental Tillage and Motor Ploughing, a Note on	157		

Other Aspects of Plant Pathology.

IN the last two numbers of this Journal attention has been drawn to the views expressed by Mr. C. O. Farquharson, late Mycologist of the Agricultural Department of Nigeria, in a remarkable letter published in the *Kew Bulletin*. The general tendency of Mr. Farquharson's remarks was to demonstrate that in many cases where crops were attacked by insect and fungus pests, the incidence of the attack is determined by some predisposing cause in the ill-health of the plants or trees, or some untoward conditions in the plants' surroundings, such as imperfect drainage, undue exposure to wind or sun, or other harmful environmental conditions which, lowering the vitality of the plant, render it a prey to pests and diseases. The incidence, therefore, of many of these pests and diseases may be regarded as symptomatic of other, and often deep-seated, troubles the causes of which have to be sought out and remedied before the specific attacks of special insects or fungi can be effectively controlled.

Basing his suggestions on these ideas, Mr. Farquharson strongly urges that plant pathologists must first of all have a good all-round knowledge of agriculture, and must be able to study the crops, whose diseases they are called upon to investigate, from the broad standpoint of general agriculture and plant physiology, so as to avoid falling into the error of recommending treatment to alleviate mere symptoms, while leaving the fundamental causes unremedied.

This view of the conditions with regard to many troublesome phases of crop problems is steadily gaining ground, and is influencing the work both of planters and of their advisers. As Mr. Farquharsons's remarks imply, it is quite true that it is not advisable, as a rule, to imagine that plant pests and diseases can be effectively dealt with, when trouble is experienced, by the simple process of calling in an expert to advise on some particular point. In all cases, except the simplest, it generally happens that matters have to be regarded with the widest outlook, and the opinions of a number of men, who have had special experience in different directions, must be brought to bear upon the problems. In this work the planter himself, with his intimate knowledge of his crops and their surroundings, must play an important part.

While this aspect of the case is undoubtedly true, and is gaining increasing recognition, it is yet necessary to preserve a properly balanced outlook, so as not to be carried away by newly expressed views of the moment. It must not be thought that all pests and diseases are only of this symptomatic character, or that it is not desirable to pay careful attention to the pest or disease until the surroundings have been modified. There are many pests and diseases which evidently attack healthy plants, and in some cases appear even to pick out the most healthy and vigorous for attack. It may be well to cite some instances of this kind

The recently investigated Rosellinia disease of limes and cacao does not appear to depend upon a weakened condition of the trees for invasion to be induced. In the case of lime trees growing in newly cleared forest areas in Dominica, it has been observed that Rosellinia is troublesome where the soil is most fertile, and where it is supplied with a superabundance of vegetable matter, and it is anticipated that Rosellinia disease may probably become less troublesome as the fertility of the soil declines. This seems to be a case where the vitality of trees attacked does not prevent the invasion of the parasite, thus it is a case where the habits and life-history of the parasite require to be studied ; improving the health of the lime trees does not preserve them from damage by this fungus.

Another striking instance is the internal boll disease of cotton. As is now well known, this disease is caused by the invasion of the boll by certain specific fungi and bacteria ; these are unable to find their way into the boll without extraneous aid, but they are introduced by plant-sucking bugs, notably by the cotton stainers (*Dysdercus* spp.), and by certain other bugs, chiefly *Edessa meditabunda* and *Nezara viridula*, known locally as 'bush bugs' or 'pea chinks'. In this case vigorous health of the cotton plant does not appear to have any effect in mitigating an attack, and it is necessary to give consideration to the complicated relations which exist between the fungi and bacteria, and the insects by which they are spread, and further, in the efforts which are made to control these troubles, it has been found necessary to study the feeding habits of the insects themselves, and to take vigorous measures, backed by legislative action, to eradicate the wild food-plants of these insects, and to control the growing of the cultivated ones on which they also feed.

Another cotton pest may be referred to, which appears to attack healthy, vigorous plants quite as freely as those which are less vigorous, that is the flower-bud maggot (*Contarinia gossypii*). In this case also it is necessary to centre attention upon the pest rather than upon the plant.

In the case of the sugar-cane it does not appear that the vigour of the plant affords any measure of protection against the attack of the moth borer (*Diatraea saccharalis*), and, so far as observations have gone, the same may be said of the invasion of the sugar-cane by the fungus (*Colletotrichum falcatum*), which causes the disease now known as red rot, but which was formerly, somewhat incorrectly, called rind fungus. Here again it is the attacking pest or parasite which must be primarily studied, and its relation to its host determined. Observations also tend to support the idea that the root-eating grubs of the hardback beetles of the Lachnosterna group attack vigorously growing sugar-canes as freely as sickly ones, so that here again the vigour of the crop does not appear to afford protection from damage by this pest.

Most of the pests and diseases of cacao, on the other hand, appear to be largely dependent in their incidence on the health and vigour of the trees, so that in this industry, it is of the first importance to study plant sanitation and soil improvement.

So far as it is at present known, the newly described red ring disease of coco-nuts, caused by the invasion of a nematode worm, is not conditioned by the lack of health or vigour of the invaded trees. At present researches into this disease are not completed, but it seems evident that attention must be directed to the study of the life-history and habit of the nematode parasite.

It would appear to be possible to make a broad generalization in regard to combating the damage caused by leaf-eating caterpillars which work havoc on many tropical crops. They appear to attack healthy, vigorous plants, possibly in preference to sickly ones. As a well-known instance, the attacks of cotton caterpillars (*Alabama argillacea*) upon cotton bushes may be cited. No amount of care bestowed upon the plants themselves, nor upon the soil in which they are growing, will serve to diminish the intensity of the attack. The caterpillars themselves must be dealt with directly—a piece of work which the cotton grower knows that he cannot neglect with impunity.

Most leaf-eating caterpillars must be dealt with similarly, irrespective of the vigour of the attacked

crops. The damage which caterpillars inflict upon such crops as sweet potatoes, Bengal and velvet beans, woolly pyrol, cowpeas, are all cases in point. So also are the attacks of caterpillars on garden plants, such as are familiar in the case of the amaryllids, known as lilies in the West Indies, the leaves of which are often eaten completely down by the larvae of a moth (*Euthisanotia amaryllidis*), and of the frangipani trees (*Plumieria* spp.) which are regularly denuded of their leaves in some localities by the handsome caterpillars of a large hawk moth (*Pseudosphinx tetrio*). It is probable also that attacks of the corn ear worm (*Laphygma frugiperda*), and of the cotton boll worm (*Heliothis obsoleta*) are independent of the conditions of health of attacked plants. Other instances might also be cited.

Not long ago the attitude of planters and investigators towards plant pests and diseases was that the insect causing the damage, or the fungus causing the disease, was the main thing to be investigated, as is shown in fact to be the case in the instances mentioned above. Now observers, whether planters or technical workers, are being forced to the conclusion that the health and vigour of the attacked crop or plant is frequently the determining factor in regard both to the attack and its remedy; consequently, plant pests and diseases assume a wider significance. It is therefore recognized that it is difficult, in many cases impossible, for a single individual to handle some of these problems as an expert in all the questions concerned. In many cases there is required the united knowledge of a number of men, including trained planters and technical specialists, having knowledge of many aspects of biology and agriculture. This is where a properly organized Department of Agriculture fills a very important function. It provides with regard to the problems of plant sanitation a group of specialists, who, working in intimate association, are able to present to the planter the sum of their combined knowledge, which may be applied by him to practical agriculture in conjunction with his own experience.

There are fashions in things agricultural and scientific, as well as in other matters, and there may be a danger lest it may become the fashion to talk only of plants' vigour, and cognate matters when dealing with plant troubles. It is the purport of this article to point out that there are instances where the insect or fungus causing the trouble does not appear to be deterred or limited in its attacks by the vigour of the host plant, but that there are, on the contrary, many cases where the attacking parasite, whether insect or fungus, has to be dealt with as the primary trouble.

PINE-APPLES AND TOMATOES IN THE BAHAMAS.

In giving evidence before the Commission appointed by the Governor of the Bahamas, to enquire what measures should be taken for rendering assistance to discharged soldiers returning to the colony, several planters gave interesting details about the chief agricultural industries, among which the cultivation of pine-apples and tomatoes appear to be leading ones.

One planter, who has been growing these crops for many years at Eleuthera, speaks of the soil of that island as being for the most part very fertile, and well suited to these fruit crops. Pine-apples will not grow on any land; but what is known as the 'red soil' of Eleuthera needs only a small amount of fertilization for pine-apple culture. Pine-apples are usually planted about 2,200 dozen plants per acre, and good cultivation occasionally yields a crop from about 90 per cent. of the plants, though, on an average, the yield is not from more than 50 per cent.

The prices of pine-apples vary; at present they are fetching 2*s.* per dozen, though the usual price was hitherto 1*s.* 6*d.* per dozen. There was formerly a much larger area of land under pine-apples in the island of Eleuthera, as is shown by the fact that a crop of no less than 500,000 dozen pine-apples was grown there in the year 1892, while at present it is estimated that a total of not more than 50,000 dozen forms the crop. People gave up planting them, because it did not pay when they used to get only 1*s.* 6*d.* per dozen. Now, however, that the price has risen to 2*s.* per dozen, they are anxious to plant again, but it is difficult to obtain plants. The planter referred to states that on his cultivation of 40 acres this year the expense has so far been £500, but he hoped to reap from 15,000 to 20,000 dozen pine-apples this season. On an average market, the clear profit ought to be from £40 to £50 per acre, and for some years there has been nothing which has paid better than pine-apples. In conjunction with his cultivation, this planter conducts a large canning factory in which he employs 500 people daily.

With reference to tomato growing, this is considered to be rather more risky, because of the need of rain at particular seasons for the success of the crop. Sometimes tomatoes are raised in the same fields that have been planted with pine-apple cuttings between them. For the last three years, the planter from whose evidence we are quoting, has been growing tomatoes along with pine-apples. From planting tomatoes among 900 dozen pine-apple slips he obtained a yield of 500 crates of tomatoes. It appears that the tomato crop of the whole district was estimated at about 100,000 crates from 500 acres of land, though it is considered that if there had been better transportation facilities, this crop could have been more than doubled, as the tomatoes from the Bahamas seem to possess a good reputation in the New York market.

The tomato industry is a most important and profitable one, but it is essential that individual packers should carefully grade their produce for packing in separate crates, in order that the purchaser may know with certainty what sized fruit each crate contains. An exporter who packs his produce in a reliable manner will obtain nearly twice as much for his crop than is obtained by other exporters who do not take the same care. Even a partially improper packing gives a bad name to the whole of a consignment.

CUBAN SUGAR INDUSTRY, PAST AND PRESENT.

An interesting paper published in the *Cuba Review*, March 1919, gives a history of the progress of the sugar industry in Cuba, and draws attention to the very striking contrast between the conditions of the industry in the past and those of the present day, both with regard to the manufacture of sugar, and the production of the crop.

The production of sugar in Cuba in the early years of the eighteenth century of some 40,000 tons, the further production towards the close of the War of Independence in 1898 of some 300,000 tons, and the tremendous contrast between these moderate quantities and the over 4,000,000 tons predicted as the crop of 1918-19, give an invitation to look back over the history of this by far the most important of Cuba's industries, upon which the welfare and happiness of fully nine-tenths of her inhabitants depend, to note the different conditions under which sugar has been produced, and the methods which have been employed at different periods.

Not many years after the occupation of the island by the Spaniards, and at about the time Diego Velazquez had been made Governor, sugar-cane had been introduced, and its production was being given considerable attention, its plantings being doubtless confined largely to the eastern portion of the island. Thus it was that in 1792 some 493 small mills produced about 14,600 tons of sugar, while in 1802, only ten years later, the number of mills had increased to 870, producing approximately 40,800 tons, while in 1870 some 1,200 mills produced about 610,000 tons of sugar, thus showing an average of about 500 tons or 3,500 of the present-day bags per mill.

The earliest mills used in the island were the very crudest of affairs. Short vertical or horizontal rollers were used, moved by animal power, and the canes were inserted between the rollers, one or two at a time, by a man employed for this purpose. Frequently it was found necessary to bruise the ends of the cane in order to allow it to be inserted and grasped promptly by the roller. The juice extracted was carried by hand to the evaporating kettles, large open affairs, and here, over a fire maintained by the use of wood and the refuse cane, stoked by a human attendant, the juice was evaporated to as great a degree as possible without burning. Later on animal power was substituted by steam, and more perfect grinding was accomplished, but even under the best circumstances sugar was obtained only to the extent of from 5 or 6 per cent. of the weight of the cane ground, as compared with from 12 to 14 per cent. in the modern mills. During this period the imperfect crushing of the cane left a bagasse which was filled with moisture, making it necessary to have a considerable force of labourers, who would remove this material, spread it over a large area close to the mill, leaving it to dry in the sun, after which it was again brought to the mouths of the furnaces to be used as fuel. Upon indications of a shower, the whole mill force was hurried into the drying field to pile this bagasse into ridges, thus permitting only a relatively small portion to become wet. Great changes, and of tremendous importance to the stability of the sugar industry, have occurred within the mills themselves. The old system of two or three rollers, in which the cane was very imperfectly crushed, has given place to the modern train of mills, sometimes consisting of as many as six mills composed of eighteen rollers preceded by one or two sets of crushers. To the crushers the cane is brought by carriers, and the bagasse, as it proceeds to the last mills, is treated with water and a combination of water and juice, so that the greatest possible percentage of the sugar content may be extracted.

The article then goes on to describe the modern process of evaporating the water from the juice, and the crystallizing and drying processes as carried out in a large modern factory, which, being familiar to most of our readers, is not reproduced.

Attention is then directed in the contrast between the former and the modern methods of cane cultivation in Cuba.

Changes have occurred in the methods of cultivation that correspond in importance to those brought about in the factories themselves. The first cane of the island was undoubtedly produced on lands from which the forests had been felled, and with the aid of only the cane knife or 'machete' and the hoe. This system is still employed in those parts of Cuba where virgin forest abounds, and is practically the most economical and satisfactory method of producing sugar-cane, as when planted on fertile virgin soil of this character, the cane stools ratoon and produce crops for many years without the necessity of new plantings.

The first ploughs to be used in Cuba were beyond a doubt composed of crooked sticks, and doubtless were without a metal point of any description. At a later date the rounded metal instrument with extended point was added, and a means of lowering and raising the 'plough point', thus enabling deeper or shallower ploughings to be effected. By means of this instrument excellent ploughing can be done, but the work is very slow, and entirely inadequate to the preparation and planting of the tremendous areas required for replanting cane each year. The introduction, therefore, of the modern American plough was a boon to the sugar planter. The extremely heavy soils utilized for cane planting in Cuba rendered it necessary to use from two to three pairs of oxen on each plough, requiring two men to each outfit. Also even with this instrument the preparation for planting was slow, though much more rapid than with the native plough. Consequently, it was quite natural that shortly after the American occupation the idea should be conceived that the tractor as used in the United States should be introduced into Cuba. This was done, and after years spent in remodelling and adapting both tractors, ploughs, and harrows, to the tremendous strains caused by the intractable nature of Cuban soils, instruments have been perfected by means of which satisfactory work can be done. In addition to, in fact preceding, the introduction and successful use of the American tractor, there was employed here an English system, expensive and heavy, it is true, but productive of good results, and enabling the planter to plough practically to any depth that he might desire. The system referred to consisted of two tractors, each containing a large drum, around which is drawn a cable extending to the gang plough, usually made up of three shares, from which the cable continues to the other tractor on the other side of the field. Thus these tractors practically stand still, the plough being pulled alternately from one side of the field to the other, while the idea sought in the American tractor is to produce an instrument which, drawing the plough after it, would work economically and successfully.

These American tractors, and also smaller ones hardly capable of turning over the soil, have been utilized for harrowing and cross ploughing, and, where special machines have been adapted to this purpose, for cultivation of the growing cane, as also for drawing the wagons and carts loaded with cane at the harvest time, and their work has proved to be labour-saving and very economical.

Besides the means of hauling already mentioned, other improvements on the old carts and oxen, such as four wheel wagons drawn by both oxen and mules ; portable tracks laid down at intervals in the cane fields, over which small cars are drawn by animals ; and four-wheel trailers to be drawn by the tractors, have been introduced with success.

A further step, still rather in the experiment stage, although practical and very advantageous results have been secured with the one machine of this nature which has been introduced, has been taken through the invention of a tractor with which a number of demountable beds are employed. The tractor is made in such a way that the power required for its movement from place to place can be thrown out of gear with the rear wheels, and thrown into gear with a set of winches which control and operate a cable, which, when fastened to the demountable bed after the same is loaded with cane, raises and drags it upon the body of the tractor. Trials made with this machine at 'Manati' last year demonstrated that as many as 10 loads per day could be made with a $2\frac{1}{2}$ kilometer haul, at a cost per 100 arrobas of cane of about 25c., but we understand that the same machine this year has shown a cost of 21c., these figures comparing with costs by oxen varying from $1·00 to as high $2·00 per 100 arrobas. That this machine has a great future if present indications regarding its advantages prove true, there can be no doubt.

The harvesting practice as observed here is the same as in all other cane-producing countries wherein the cane is still cut by labourers, each employing a cane knife varying in shape and character with each country, but usually consisting of a heavy blade from 16 inches to 2 feet in length, usually with a slight crook in the blade, designed to enable the cutter more easily to cut the stalks low or at the surface of the ground, this being essential to the continuous production, for a number of years, of good ratoon crops. Attempts have been made to perfect a machine that will cut cane, but the great variety of conditions under which cane is produced, of the character of land upon which it is grown, and, consequently, of the condition of the cane at the time of cutting, has rendered this a task which no one has yet been able to accomplish. A machine has been made by which straight growing canes can be handled with reasonable satisfaction, but when the cane, on account of heavy growth, falls down and extends itself along the ground forming practically a tropical jungle, as is the case in the fertile lands of Cuba, it has been found impossible to handle it this way. Work has been continued on the improvement of these machines, and the increasing scarcity of labourers to handle the ever increasing areas planted will at some date bring about the desired result, as necessity will prove in this case as in others the 'mother of invention'.

We thus observe from what has been written that there has never been a time when Cuba's sugar mills and her planters have had at their disposal the means for the economical production and advantageous grinding of her cane that exist to-day, and, therefore, with the probabilities of increasing improvement, especially in the field of production, they can look forward with hope to the future. That the present abnormal prices of sugar will continue cannot of course be believed, but with almost the same security it can be taken for granted that the cost of production will gradually be lower, probably the fall in price and the lowering cost of production keeping pace with each other in such a manner as to provide for equivalent profits under the new prices that will prevail. Of course, this is conjecture, but it seems reasonable that with the more economical devices at the control of the planter, he will be able to lower his production cost. There is no doubt that the majority of Cuba's sugar mills are now in a position to produce sugar at much lower cost than formerly, but they are also in a position to grind very much heavier harvests. Where irrigation is possible, it will be given a prominent part in this work, as with the decrease in the forest area there has come a decrease in the total annual rainfall, and a much less even distribution than formerly, resulting in comparatively dry weather during late July and August, the two months of heaviest growth of the cane under proper conditions. The prediction has been made that the present crop will amount to 4,000,000 tons, and it is believed that sufficient cane is in the fields to enable not only this quantity of sugar to be made, but considerably more.

AGRICULTURE IN BARBADOS.

The topic everywhere is the continuance of the drought —one of the severest on record.

In a few of the hilly districts there were about half a dozen days of light showers during April, but elsewhere the record has been practically nil. The extreme north and east of St. Lucy and the sea-boards of St. Philip and Christ Church are suffering intensely. With the opening of May, however, there have been indications of more favourable weather.

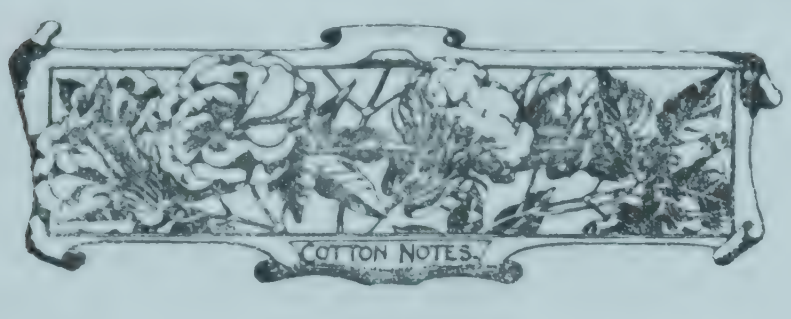
At this time we have generally had the pleasure of recording the healthy start made by the fodder, corn, and early yam crops, but it goes without saying that this season it has been as yet impossible to do planting of any kind. Here and there small areas have been forked, and cane holes opened, so that the first showers may not be lost, but almost everywhere the earth is too hard for tillage.

The fall potatoes planted in November and December have had a trying time, and will not yield the return which had been hoped for. In some instances the vines are leafless, and no progress has been made at all. In addition to this there is the fact that no supplying was possible with some fields. Not only has there been, therefore, a stunt, but there is the presence of a large number of dead holes. There will be great shortage of local provisions after the present mature fields have been disposed of. Cereals are the quickest crops, and these should be freely planted as soon as weather conditions make this possible.

The hardihood of the cane plants is being thoroughly tested. Everywhere the wonder is expressed that the young canes have been able to live on. With the prolongation of the drought there are, however, signs that the subsoil is becoming too dry to maintain life. Fields, green up to a fortnight ago, have developed yellow leaves, and there has been an increasing number of dead holes among the supplies.

We have reached a point in our agricultural history where we should seriously consider the fertilization of our cane fields from home-grown products and home-made manures, and reduce the popularity of commercial fertilizers. To do this we must pay much more attention to the collection of material for manurial purposes, and enrich our pastures so that they may produce twice as much or even three times the amount of vegetable matter which we now obtain from them.

Steady progress is being made with the reaping of the cane crop. It is well that there should be no delay, for the tale of rotten canes is growing apace, and the B. 6450 is rapidly developing a dry heart because of the very dry season we have had.—(The Barbados *Agricultural Reporter*, May 3 1919.)



COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended April 26, 1919, is as follows:—

ISLANDS. There was a very general demand for the offering stock of the odd bags, classing Fine to Fully Fine, resulting in the sale of the entire stock of this quality, on a basis of our quotations, the buying being for the Northern and Southern Mills. The supply of bright cotton, classing Fully Fine to Extra Fine, is limited to the planters' crop lots, which are held at 5c. to 10c. higher.

The medium and lower grades have not been in demand.

We quote, viz.:—

Fine to Fully Fine, @ 53c. to 53½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. The Savannah market has been very quiet throughout the week, the sale reported by the Exchange being cotton bought in the interior markets.

Although there has been more inquiry during the past few days, the offerings are small, consequently the buying has been limited.

The better grades, Fancy, and Extra Choice, are scarce, and firmly held. The lower grades are not in demand.

We quote, viz.:—

Fancy, 53c. to 53½c., f.o.b. and freight.
Average Extra Choice, 52½c.
Extra Fine, 49½c

The exports from Savannah for the week were, to Northern Mills 230 bales, and from Jacksonville to Northern Mills 239 bales.

COTTON GROWING IN VENEZUELA.

A note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, November 1918, draws attention to the cultivation of cotton in Venezuela. It is stated that this cultivation has been regularly carried on since the American civil war. During the last twenty years the cotton manufacturing industry has developed considerably in Venezuela, and in spite of a heavy import duty on raw cotton the manufacturers have frequently been obliged to import it from the United States.

The high prices, however, that have prevailed for the past two years for cotton and cotton goods have given a great stimulus to cotton growing. The Government has aided in this movement by the distribution of seed. Accordingly the area under cotton has been very largely increased, and a bright future is predicted for the industry. The climate and soil of Venezuela are better suited to the growing of Upland varieties of cotton than Sea Island or Egyptian. Cotton growers in Venezuela have to contend at times with locusts, which have proved very disastrous on occasions, and were largely responsible for a serious drop in production between the years 1912 and 1915.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. Mr. Sands writes to say that during the month of April lands were being pet in preparation for planting. Sea Island cotton ginnings for the season up to April 30 amounted to 1,007 bales. Selection of cotton seed for planting has been started at the ginnery. The rainfall recorded at the Botanic Station for the month was 5·12 inches; at the Experiment Station, 5·10 inches.

GRENADA. Plant distribution during the months of March and April included: orange, 5; mango, 2; ornamental 25; yams, 2,380lb.; coco-nuts, 5,918; horse beans, 1,652lb, onions, 7 packets; various beans, 17 packets. The Superintendent of Agriculture states that in some sections good pickings of cacao are being made, but at high altitudes pickings are said to be small. Recent quotations on the English market were as high as 107*s.* per cwt. The condition of other crops was normal. Several coco-nut trees are reported dead from red ring disease. The weather continues dry. The rainfall recorded at Richmond Hill Station during the month of March was ·64 inches; the record for April is ·85 inches.

COCO-NUT PRODUCTS IN THE PHILIPPINES.

A report on the above subject, by W. S. Cookson, appears in the *Agricultural Bulletin* of the Federated Malay States, Vol. VI, No. 11. Owing to the increasing interest that is being shown in tropical regions in the cultivation of coco-nut trees, and the production of coco-nut oil, much of the report is reproduced below.

From a definite census attempted in 1918, it would appear that the total number of coco nut trees in the Philippines is about 31,000,000, and the crop from them for the fiscal year 1917-18 came to about 892,000,000 nuts, an average production of about twenty-nine nuts per tree.

Considerable variation is shown in the rate of yield. The highest yielding district is Zamboanga, with an average of 45 nuts per tree. Cebu shows 22 nuts. Five other districts show the following figures: 19½, 19, 13, 9, 8 nuts per tree per year. Two districts show an average of only 6 nuts per tree per year.

No coco-nuts are grown near enough to Manila to make possible the transport of nuts to the oil mills which are all in Manila, excepting one at Cebu and one newly erected in the San Pablo coco-nut district. All oil is made from copra. The oil mills do not own any coco-nut plantations, but buy copra in the open market.

The bulk of Philippine copra is native dried, chiefly over crude smoke kilns. It is inferior to Malabar or Cochin copra, and is in fact of only average marketable grade, and has no special qualities to distinguish it from other copras of similar grade, produced in other parts of the world.

The output of copra has grown steadily since 1899, when it was 14,000 metric tons. In 1912 it was over 169,000 tons. Up to 1912 no oil had been produced except on a small scale by antiquated processes. About 50,000,000 nuts were made into oil in 1913, and some 4,600 tons of oil were produced, of which only 1,300 tons were exported. In 1912 and 1913 modern oil mills were established, and the production of coco-nut oil increased to 16,000 tons for 1916, and 49,800 tons for the fiscal year ending June 1917. In 1916 72,000 tons of copra were exported. Figures of copra export for 1917 are not available in tons, but it is known

that copra to the value of £1,388,418 was exported in the fiscal year ending June 1917, and to the value of £1,905,448 for the year ending June 1918. It is expected that a shortage of copra will be experienced after 1918.

Previous to 1915 coco-nut oil was produced in very few factories, and chiefly in the P.V.O. of Manila and the Visayan mills of Cebu. There were also a few small oil mills with modern machinery, and also a certain amount of oil produced in the native villages by the ordinary native hot-water extraction process.

To-day there are in Manila alone twelve factories, and the value of coco-nut oil exported in the first quarter of 1918 was £1,610,000. The coco-nut oil mills are making large profits, and new mills are going up rapidly.

There is considerable optimism for the future of coco-nut growing in the Philippines. The price of copra is now low in proportion to the price of oil, owing to the preference for oil as cargo, and the lack of oil expressing facilities hitherto.

It is not improbable in fact that there will arise a period of competition among oil mills for copra supplies, which, being limited, are apparently destined to get short, and in consequence the price of copra during that period may be relatively higher than that of oil. It is expected that an immediate fairly heavy fall in the American price of coco nut oil will follow the cessation of war, through the feeling of security of future supplies as ocean tonnage increases.

The present high price of coco nut oil will probably decline, but lower freight rates will possibly largely compensate. The general opinion in the Philippines is that the future of the coco-nut oil business is promising, with the expectation that the eventual volume of business will be limited only by available supplies of copra.

THE HYDROCYANIC ACID CONTENT OF GUINEA CORN.

It has long been known, and the subject has been referred to in several previous volumes of the *Agricultural News*, that a cyanogenetic glucoside is present in Guinea corn (*Andropogon sorghum*) in certain stages of its growth. This glucoside is not poisonous by itself, but in contact with an enzyme which is present in the plant tissues it breaks up into several compounds, one of which is hydrocyanic acid. It is on account of the formation of this latter substance that Guinea corn fodder acts at times as a poison, and cases of poisoning of cattle by eating Guinea corn fodder are not of infrequent occurrence in some countries, as in the United States and in India, although such cases appear to occur but rarely from the use of the varieties cultivated in the West Indies. A paper in the *Agricultural Journal of India*, Vol. XIV, Part 1, by Manmathanath Ghosh, M.A., Assistant Professor of Chemistry and Physics, Sabour Agricultural College, gives an account of trials made to find out the effects of different times of planting, and also of water-logging on the formation of the glucoside in *Andropogon sorghum*, known in India as 'Jowar'. The experiments were undertaken in 1916 and repeated in 1917, and in the article referred to the results are set out very fully in tables.

The conclusions reached may be summarized as follows:—

The time of planting does not appear to have any effect on the formation of the glucoside to which the name 'dhurrin' has been given. With the three sets of plots sown at different times, and nearly at a month's interval between one and the next, there was no difference between the first and the second set, both as regards the maximum yield of the poison or its rate of diminution as the plants grew up, but the third only showed half the maximum quantity of the poison, though the rate of diminution of the poison was very much the same.

It therefore appears that while the time of planting by itself has little or no connexion with the formation of the glucoside, yet a crop planted late has a much better chance of producing smaller quantities of the poison on account of the more abundant moisture generally found in the soil at such a time. Dhurrin occurs principally in the leaves and young shoots. There is a very much smaller quantity of it in the stalk, from the time the plant grows to an appreciable height.

The factors which so far seem likely to bear on the production or otherwise of the glucosides are examined in some detail. In the first place an abundance of moisture in the soil is always associated with a low percentage of dhurrin, and sickly plants growing in water-logged soils contain only a minute quantity. The contrary is also probably true, namely that a deficiency of moisture in the soil, or a dry season conduces to excessive production of the glucoside. Secondly, it is not necessarily true that the rate of growth has a correlation to the poison-producing power in the plant. In the case of strong and weak plants growing side by side in the same field, the weak plants do not always yield the greater amount of hydrocyanic acid. Thirdly, there is a far greater amount of nitrogen accumulated in the leaves than in the stalk. The appearance of this greater quantity of nitrogenous substances in the parts where the greatest quantity of hydrocyanic acid occurs, is an indication that the production of the glucosides is in some way correlated with the production of the nitrogenous matter. Water-logging presents an unfavourable condition for nitrogen assimilation, as it prevents bacterial activity and stops nitrification. In warm, dry weather, before the rains have actually fully set in, the seat of nitrification is much nearer the surface, and presents a more favourable condition for nitrogen assimilation by the young plants whose roots at the time do not penetrate very deep. With the coming in of the rains the bacterial activity moves downwards, when the glucoside formed is rapidly utilized to furnish higher and more complex compounds, so that there is less and less hydrocyanic acid obtained as the plant grows up. In years of scanty rainfall, when the vital activities of the plant are retarded on account of lack of moisture, the utilization of the cyanogenetic compounds probably takes place much more slowly, and the plant contains a quantity of the poison which it cannot at once utilize for higher compounds.

It would appear, therefore, that the weather is mainly responsible for the development of the poisonous principles in Andropogon. The soil is only of minor importance, and is accountable for the condition only so far as it can supply nitrogenous food materials to the plant. The soil, therefore, though it may help in the production of the glucoside, is only a minor factor, and the weather, notably rainfall, is the factor of most importance.

DEPARTMENT NEWS.

Sir Francis Watts, K.C.M.G., Imperial Commissioner of Agriculture for the West Indies, intends to leave Barbados for England about the end of the month, on duty.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

Imperial Commissioner of Agriculture for the West Indies — Sir Francis Watts, K.C.M.G., D.Sc., F.I.C., F.C.S.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial draws attention to some aspects of the work of plant pathologists which are sometimes apt to be overlooked by the general public.

Insect Notes, on page 154, contain two articles of interest in connexion with the campaign for the destruction of the cotton stainers, drawing attention to a parasite fungus found on dead cotton stainers both in Antigua and St. Vincent.

A note on implemental tillage and motor ploughing, on page 157, will be found very suggestive as to some problems connected with the question under conditions existing in the West Indies.

Dr. C. A. Barber, C.I.E.

In a letter recently received by the Imperial Commissioner of Agriculture for the West Indies, Dr. Barber states his intention of shortly resigning the position which he now occupies as Sugar-cane Expert to the Government of India. It will probably be remembered that Dr. Barber's first investigations on sugar-cane were undertaken in the West Indies, when he was Superintendent of Agriculture in the Leeward Islands. During recent years he has been in charge of sugar-cane investigations in India as Sugar-cane Expert. His work has been a scientific research into the botanical characters of sugar-cane seedlings produced on Mendelian principles, which, under the various soil and climatic conditions of the different cane-growing districts of India, may yield larger crops and contain a greater percentage of sucrose than the indigenous varieties hitherto cultivated. This work has frequently been referred to in previous numbers of this Journal. It is not too much to say that Dr. Barber really laid the foundation of scientific investigation of sugar-cane.

Dr. Barber has also made valuable contributions to botanical knowledge by his researches into the life-history of several Indian plants, of which we may mention his investigation with regard to the very interesting manner of growth of the sandal wood tree.

Wormseed Oil.

An article in the *Perfumery and Essential Oil Record*, March 1919, draws attention to the natural resources of India for the production of essential oils and drugs, and the considerable extension of the industry in recent years.

One of these drugs, which can apparently be produced profitably and in large quantities in India, is wormseed oil, derived from the seeds of *Chenopodium ambrosioides* and *C. anthelminticum*. The value of this oil is well established in the treatment of ankylostomiasis or hookworm disease, an active campaign against which is now being waged, as our readers doubtless know, in many of the West Indian islands.

In the *Agricultural News*, March 8, 1919, attention was directed to the use of wormseed oil in the treatment of ankylostomiasis as reported from Fiji, and the common occurrence of *C. ambrosioides* in these islands was noticed.

The article referred to above says that the greater part of the oil has hitherto been distilled in the State of Maryland, but that the seed is harvested also in considerable quantity in Florida. Wherever it is cultivated for oil production regard must be paid to the fact that Chenopodium grown in different places, and oils distilled by different processes, have varying degrees of efficacy in the treatment of ankylostomiasis. It is suggested that, in order to ascertain the best oils for prescription, physicians should obtain information as to the sources of the oil used, and, if possible, the method of distillation. Such an indication from those employing the drug would doubtless be of value to anyone entering the field of production.

English Chamber of Horticulture.

The inaugural meeting of the newly formed Chamber of Horticulture in England was held on December 2, 1918. A report of this meeting has been forwarded by the Secretary of the Chamber to the Imperial Commissioner of Agriculture for the West Indies.

In his communication to the Imperial Commissioner, the Secretary, Mr. R. Wynne, states that it is the wish of the Chamber that it should come into close co-operation on matters of horticultural interest with institutions dealing with economic botany in the colonies and dependencies of the British Empire.

The formation of such a Chamber is evidently a step towards the unification of interests in the horticultural industry not only in England itself, but throughout the Empire.

The Destruction of Food-plants of Cotton Stainers in Montserrat.

In the *Agricultural News*, Vol. XVII, No. 433, it was noted that, following the example of St. Vincent, the Legislature of Montserrat had passed an Ordinance relating to the compulsory destruction of silk-cotton trees and other host plants of the cotton stainer, and that the campaign had actively begun. In a recent letter to the Imperial Commissioner of Agriculture from Mr. W. Robson, Curator of the Botanic Station, Montserrat, it is stated that the total number of silk-cotton trees destroyed up to the end of April was 1,493, of which 977 were felled in the Olveston and Woodlands districts alone, and that many more remained there. The work in this district has been done by men employed by the Government and supervised by the officers of the Agricultural Department. On certain outlying estates the work is supervised by the proprietors or managers of the estates.

Changes in Modern Methods of Industry.

In his introductory lecture, on taking over the duties of the Chair of Metalurgy in the Royal Technical College, Glasgow, Prof. Cecil Desch laid emphasis upon the changes in the methods of industry which have recently been taking place. *Nature*, April 10, 1919, says that he quoted from Prof. Patrick Geddes a definition of the division of the industrial age into two periods: the 'palaeotechnic' and the 'neotechnic'. In the earlier of these the aim of industry was merely the accumulation of wealth. Natural resources were squandered recklessly, the one consideration being their rapid conversion into marketable products. Human life was disregarded, the cheapest labour being utilized without reference to any standard of life. It is, however, being realized nowadays, both by the employers of industry and the workers themselves, that natural resources must be used with the utmost economy, avoiding unnecessary destruction; that health and comfort must be considered in the planning of works; and that the erection of squalid dwellings crowded into a minimum of space must give place to town-planning on a scientific and sound basis. Professor Desch said that the symbol of the palaeotechnic age was the furnace filled with raw coal; that of the neotechnic age is the electrical power-house, with its clean atmosphere and white tiled walls.

A New Machine for Exterminating Weeds.

In view of the fact that nowadays much attention is being given to implemental tillage everywhere, a description in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, November 1918, of a new machine invented in the United States of America for exterminating weeds, particularly 'couch' or 'quack' grass, seems of interest.

This new machine resembles a tractor in appearance, but does not propel itself. The petrol motor mounted on it serves to operate the mechanism, while the machine itself is drawn by horses or by a tractor.

The machine consists of a frame work mounted on wheels, carrying at its forward end an ordinary plough, minus the mould board, behind which is a toothed cylinder, followed in the rear by an elevator running backward and upward into the separating mechanism, which in turn is followed by a large, circular sieve moving in a direction opposite to the hands of a clock as the machine travels forward. Inside this circular sieve is a horizontal conveyor running to a perpendicular elevator-swing at the rear of the machine, which conveys the weed refuse into a wagon driven alongside.

The operation of the machine is described as follows: the plough share located at the forward end is 16 inches wide, and set to run at a depth of 4 to 6 inches; the ribbon of soil cut is passed back, there being no mould board, and brought into contact with the teeth of the forward cylinder which cuts and shreds up the weeds and soil. At this point about 60 per cent. of the soil is returned to the earth, while the weeds, stalks, etc. are passed into the separating machinery, where a system of separation, not unlike that of a wheat-threshing machine separates the weeds and about 20 per cent. of the soil, which latter is returned to the ground. All the weeds and roots and the remaining 20 per cent. of the soil pass into the revolving sieve in the rear. The soil is completely passed through the meshes of this sieve, while the weeds are carried onwards by the horizontal conveyor to the elevator in the rear, to be passed into a vehicle and carted away to be burned or otherwise destroyed.

A field is thus left in a condition free from all weeds. Perhaps an instrument of this kind might be of use in dealing with 'devil's grass' and 'nut grass', on flat lands at least, in the West Indies.

The machine is said to have a capacity of 3 to 5 acres per day according to the nature of the soil, the thickness of the ground, and the speed at which the machine is towed. This new tool is said to be strongly made, and should last from five to eight years; its estimated cost is £200. It is manufactured by the Quack Grass Exterminator Co., Minneapolis, U.S.A.

INSECT NOTES.

Chinch Bug Fungus.

The following letter to the Imperial Commissioner of Agriculture for the West Indies has been received from Mr. T. Jackson, the Curator of the Botanic Station, Antigua, transmitting cotton stainers supposed to have been killed by a fungus. This is of general interest:—

'I am forwarding to you under separate cover some dead cotton stainers. These were obtained from under a mahoe tree growing in the Botanic Station. The tree in question had very many insects some weeks ago, but although young stainers are still somewhat abundant on it, there are only a limited number of adults.

'A number of the insects sent are covered with mycelium which, possibly has been the cause of death. As many dead insects (adults and half-grown) are to be found under the tree in question, it would seem as though this fungus, or some other control, is at present keeping the pest in check.'

The fungus has been identified by Mr. W. Nowell, Mycologist on the staff of the Imperial Department, as *Sporotrichum globuliferum*, a parasitic fungus on insects of wide distribution. It has been found attacking thrips of cacao in St. Vincent and Grenada, as was noticed in the *Agricultural News*, Vol. XV, p. 430, and it is also well known as an important natural enemy of the chinch bug in Kansas and other localities in the United States, where it has been a serious pest of corn, wheat, and other cereals for many years.

This is the first record of any considerable number of cotton stainers being found dead around their food plants in the West Indies, and it would appear that the conditions are not often favourable for such an attack as this one. At the same time it must be stated that the campaign which is now being carried out against the wild food plants of the stainers is resulting in more attention being paid to these insects in relation to such plants as the mahoe, or John Bull (*Thespesia populnea*) than was formerly the case, and it is possible that previous to the initiation of the campaign such an attack might have passed unnoticed. It must also be pointed out, however, that in St. Vincent attention has been directed to the relation of stainers to their wild food-plants for several years, and that this fungus has been known for some time to occur in that island, and yet no attack of the fungus on the stainers has been previously reported.

In past seasons cotton stainers have occurred in large numbers in almost all the islands where cotton is grown, and there have been sudden disappearances of the insects. Sometimes they have flown away from the cotton fields in swarms, as for instance during the cotton season just passed in St. Kitts and Nevis. At other times they have disappeared without any observations being reported as to how and where they went. If in such a case as the latter the stainers had been killed by a general attack of fungus, it is to be expected that the dead insects would have been found in sufficient numbers to attract attention.

The fungus is easily cultivated in an artificial medium, such as flour paste, with a little meat extract added, and it is hoped that trials will be made to see whether any good results can be obtained by a distribution of the fungus directly to the field, or by infecting stainers in the laboratory and liberating them in the field.

In Kansas, where perhaps the greatest amount of work of this kind has been done in the employment of this fungus for the control of the chinch bugs, it has been decided that if the fungus is present in any locality, its natural spread provides the maximum of its efficiency, and that nothing is to be gained by artificial distribution.

The subject is thoroughly discussed in *Bulletin* No. 191 of the Agricultural Experiment Station of the Kansas State Agricultural College, issued November 1913, with regard to the conditions of temperature and humidity, seasonal reaction, and all other conditions affecting the inter-relation of the insect and the parasitic fungus, as these occur in the State of Kansas. The following general conclusions are expressed:—

'We therefore hold that the facts of the life economy of the chinch bug and of the chinch bug fungus, and evidence of properly conducted experimental tests unite in showing that artificial distribution of the chinch bug fungus, either on diseased bugs or on artificial cultures, is not worth the time and trouble that it takes.'

The conditions in these West Indian islands are not the same as those in Kansas, nor are the habits of the cotton stainer, the insect to be dealt with, the same as those of the chinch bug. While therefore a careful trial of the artificial spread of the fungus is worth being made, in face of the conclusions reached in Kansas too much must not be expected from such an experiment. H.A.B.

THE MAHOE COCHON TREE IN RELATION TO COTTON STAINER CONTROL IN ST. VINCENT.

The following notes, contributed by the Agricultural Superintendent, St. Vincent, Mr. W. N. Sands, are of special interest at the present time with reference to the appearance of the chinch-bug fungus in Antigua, as reported in the preceding column.

They also afford another proof of the careful investigation into the control of cotton stainers that is being conducted in St. Vincent by the officers of the Agricultural Department there:—

The 'Mahoe cochon' or 'Dobarubois' (Douve bois) tree (*Sterculia caribaea*) occurs in the mountain forests at the northern end of St. Vincent at elevations between 800 and 1,500 feet. It has been described by the writer in relation to the local cotton stainer (*Dysdercus delauneyi*, Leth.) in the *West Indian Bulletin*, Vol. XVI, pp. 249-50. In the campaigns against the food-plants of the pest during the past three seasons, this tree was not destroyed, although the cotton stainer was known to feed and breed on its seeds. The reason for this was that from extended observations it appeared that, although the insect was attracted to the tree in the dry months of March and April each year, yet few apparently survived the unfavourable conditions of the wet forest in the succeeding months of very heavy rainfall. Further it was considered that the cotton stainer was essentially an inhabitant of the coastal districts or lands at low elevation with a relatively dry climate, because its chief food-plants,

namely cotton (*Gossypium* spp.), silk-cotton (*Eriodendron anfractuosum*), 'John Bull' or 'mahoe' (*Thespesia populnea*), wild ochro (*Malachra capitata*), all occurred in these places. In July 1918, when the question of starting a campaign against the 'mahoe cochon' tree was raised, the writer reported as under :—

'With regard to the 'mountain John Bull', or 'mahoe cochon,' I am doubtful whether it would be wise to attempt to eradicate it in the position it occupies at the northern end of the island. I hardly think that many insects escape the unnatural conditions of the wet forest there. Many may be attracted thereto in the dry season, but few, I believe ever return'.

However, the matter was not lost sight of, and an effort was recently made to obtain additional information in regard to the tree, and the cotton stainer with which it was associated ; and for this purpose two officers of the Agricultural Department, namely, Mr. L. Brown, Cotton Inspector, and Mr. F. Simmons, foreman of the Experiment Station, were instructed to make certain investigations in the district. They left Kingstown on April 28, and returned on May 2.

'The following is an extract from the report they submitted on their visit :—

'The 'mahoe cochon" (*Sterculia caribaea*) trees abound in the mountains about Sandy Bay and Owia. They never seem to grow at an altitude of less than 1,000 feet. At this time (end of April) the pods or carpids are opening and allowing the seeds to fall to the ground. The trees are not heavy bearers, but owing to their occurrence in large numbers, enough seed is produced to provide food for the numerous cotton stainers which leave the cotton fields in areas further south when the cotton stalks are destroyed. Cotton stainers were seen about the buildings and roads at Owia estate during the month of April; they were evidently on their journey from the cotton fields to the "mahoe cochon" trees. No cotton was grown at Owia. At the time of our visit the fruiting was not completed, but it was estimated, however, that within a fortnight all the seeds would have fallen to the ground. The unopened carpids on the trees had no stainers on them. On the ground there were considerable numbers of the pest in different stages of development, feeding on the seeds. We were informed that by the end of August no stainers could be seen under the trees, and that it was commonly noticed by the people of the district that the torrential rains which commence to fall in May, and continue through June, July, and August, account for the death of the insects. Rains had fallen just prior to our visit, however, and we found a fair number of insects dead on the ground beneath the trees. Some of these were partially, and others completely, covered with a distinct buff-coloured fungus. Specimens were collected. If this fungus kills the stainers, it can be reckoned as a second factor accounting for the disappearance of the pest, and it might be expected to operate to full advantage under the humid conditions that are known to exist for long periods of the year, and to be easily spread owing to the gregarious habit of the insect. We were told by our guide that a mountain dove fed on the stainers, but further proof of this would be necessary. The well known parasitic mite was found under the wings of some of the stainers, but appeared of little account.

'Some Sea Island cotton was grown last season at Sandy Bay adjoining Owia, and the growers told us that cotton stainers appeared in their cultivations in December, when the bolls were opening. The length of time from the disappearance of the insect from the "mahoe cochon" trees is too long to lead us to infer that the stainers came direct from these trees. If they had been present they would have been seen when the cotton bolls started to open early in October. No one, however, could inform us with any degree of certainty of the direction whence the insects came. After the cotton stalks were destroyed at the end of March, the people stated that the pest left for the mountains.

'To sum up, it appears to us at the present time that the "mahoe" cochon trees, instead of being a menace as a food-plant of the cotton stainer, act as a trap for it.'

The above brief account is an important contribution to the local knowledge of the cotton stainer, and it is in accordance with previous observations made by the writer. The finding of a parasite which proves to be an entomogenous fungus, *Sporotrichum globuliferum*, known in the United States as the chinch bug fungus, and locally as the thrips fungus, because it was first discovered in the colony attacking the latter insect, is of special interest; and it may be expected that as the season advances it will cause a heavy mortality among the cotton stainers in the district.

The fact that after the commencement of heavy rains each year the rivers in the district are seen to carry down with them large numbers of dead cotton stainers, is an indication that the mortality among them is very high.

Further observations will be made during the wet season, and the owner of Owia estate has promised to plant an acre of Sea Island cotton there about the first week in July, in order to ascertain whether any stainers survive; and, if so, to afford information regarding them.

It is known that the adult cotton stainer can exist without breeding for several weeks after all the cotton stalks are destroyed each season, and, in the absence of its regular food-plants, chiefly by sipping the nectar of various flowers. If, therefore, it is found desirable to encourage the insect to migrate to certain places where conditions are unfavourable to it, and where the chances of its survival are remote, then a new phase in control methods is opened up. The position of the 'mahoe cochon' trees of the northern mountains of St. Vincent appears to offer particularly suitable facilities for testing the point. It is considered from the evidence already obtained that the destruction of the trees should not be undertaken until it is definitely proved that they enable the cotton stainer to tide over the critical period April-July in each year.

In *Bulletin* No. 1 of the Station Agronomique de la Guadeloupe, recently published, Mr. J. Sydney Dash, the Director of the Station, gives some advice to cane growers in that island. Among the points noticed is cattle raising. With regard to this we translate the following remarks on ticks: 'The question of ticks is a very important one in Guadeloupe, but it would not be difficult to overcome them, if modern means of treatment were employed, viz. dips and spraying. The practice of scraping, together with the employment of antiseptics for the skin, although beneficial for a time is one of little benefit in the case of the gold tick or Senegal tick, which when it is pulled off leaves its proboscis in the skin, and produces a very painful sore'

GLEANINGS.

The most serious pest of the sugar-cane in St. Croix is the grub of the rhinoceros beetle (*Strategus titanus*). Canes attacked by this pest have the appearance of suffering from drought, the base of the stalk being eaten out until it becomes a mere shell. In some cases 80 per cent. of the crop is destroyed by this insect. (*Facts about Sugar*, April 19, 1919.)

According to a leaflet, issued on January 20, 1919, by the Department of Land Records and Agriculture, Assam, the total area under sugar-cane in that Province is 32,000 acres, which represents 1·5 per cent. of the total area under sugar-cane in British India. On the basis of the normal yield of 18 cwt. of gur per acre, the total produce amounts to 524,200 cwt., nearly 12 per cent. less than that of last year.

The American Consul-General in London has announced that instructions have been issued under which from June 1, next, the importation into the United States of nursery stock, plants, and seeds, from all foreign countries will be prohibited. Unrestricted entry of plant products imported for medicinal, food, or manufacturing purposes is permitted. The general purpose of the regulations in question is to prevent the introduction of injurious insects, various diseases, and other evils which affect plant life. (*The Times*, February 25, 1919.)

Owing to the high cost of cattle dip, the conservation of fluid by the use of adequate draining pens is worth considering with a view to reducing wastage to a minimum. Observations made by the Agricultural Department of Rhodesia show that proper draining accommodation means a saving of many pounds in a year. The double-draining pen and the long-draining race are both very economical: in the latter the wastage is governed largely by the speed at which the animals are driven through. (The *Rhodesia Agricultural Journal*, February 1919.)

Last year throughout the West Indies weather conditions were not favourable to sugar-cane cultivation. In the Northern Islands the crop suffered from a prolonged drought, and in Barbados conditions were much the same, though the drought was not so severe. In the two previous years the quantity of sugar and molasses exported from the British West Indies, equated in terms of sugar, reached about 300,000 tons for each year, but the quantity last year was some 50,000 tons less. (*Weekly Bulletin*, Department of Trade and Commerce, Canada, April 7, 1919.)

A tract of land of 25,000 acres is to be utilized in Florida for the purpose of planting and exploiting sisal on a commercial basis. Already 1,000 acres of this land have been cleared, and 750,000 henequen plants are to be set out immediately. These were planted in the nursery about two years ago, and have now reached a height of 15 inches. It is stated that in the autumn of 1921 the leaves will be fit to be cut from the plants. The decorticator machinery to be supplied will be of the most modern type. (The *Board of Trade Journal*, February 27, 1919.)

From the report on the exhibition of the products and industries of the Dependency, held at Grand Turk, on February 6, 1919, it would seem that a very creditable show was made. Exhibits numbering 857 were presented under six classes, by far the largest number being under the class Agricultural Products. Under this heading the exhibits of beans and peas, all of a very choice grade, drew especial attention. Next to this were corn products in the form of hominy, meal, and flour, from both white and yellow corn, of which there were no less than 126 entries.

In marmalade factories the orange pips are separated by the use of centrifugals. Very few attempts have been made to use them commercially, though it would be easy, after drying, to extract the oil from them, either by pressure or the use of solvents. By the use of petroleum ether, oil has been extracted from the pips, of a golden-yellow colour and almost odourless. At first the oil is only slightly bitter, but it becomes more so on keeping. The oil saponifies easily, and should be suitable for the manufacture of soap. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, November 1918.)

The area under sugar-cane cultivation at the present time in Egypt is about 67,600 acres, and over 100,000 tons of sugar are now produced, as compared to an output of 60,000 tons before the war. The annual pre-war consumption in Egypt was some 83,000 tons, causing an import of some 25,000 tons. But during the war Egypt has been able to meet local requirements out of her own production, and in addition, has exported during the three past years a net amount of 50,000 tons, plainly showing a considerable expansion of the industry. (The *International Sugar Journal*, March 1919.)

The *Tribune*, Nassau, February 19, 1919, reproduces the speech of the Governor of the Bahamas at the opening of the session of the Legislature the day before. In this speech the Governor expresses an earnest hope that it may soon be found possible to appropriate a sum of £250 per annum towards the salary of a Marine Biologist, a similar amount to be borne by Imperial Funds. His Excellency said that the appointment of a Superintendent of Agriculture and of a Marine Biologist were, in his opinion, two of the most important steps that could be taken to further the development of the Colony.

A NOTE ON IMPLEMENTAL TILLAGE AND MOTOR PLOUGHING.

One of the matters engaging widespread attention in the West Indies at the present time is the question of the increased use of implements in the tilling and weeding of the soil. It is felt that the successful development of several of the industries dependent on arable, as distinguished from orchard work, is largely concerned with the solution of the problems which these questions present.

The greatest difficulty appears to arise from the presence of the large open drains, or trenches, which are essential for the carrying off of storm water. It has been customary to plough and cultivate at right angles to these trenches, any banks or ridges being run in this direction so as to facilitate the escape of the storm water into the main drains. For these reasons weeding machines and light cultivators have also to traverse the land at right angles to the main drains, and so to cross them continually.

Where the land is moderately light, and the rainfall not very heavy, these main drains can be made so shallow as to interpose but moderate obstacles to the passage of implements; but where the land is heavy, and the rainfall great, these drains have to be both wide and deep, and are in the nature of trenches, which implements cross with difficulty. In the case of mechanical tractors intended for the hauling of ploughs, these trenches often present difficulties which are insuperable by the types of motor now available.

To meet these difficulties it has often been suggested that the direction of cultivation should be changed so as to run parallel with the drains. In some cases this may be possible, particularly where the soil is moderately light, and the drainage fairly free. When the soil is heavy this method of tilling presents marked difficulties, and those concerned with the carrying out of the work often find their ideas in conflict with those of others who advise this method of cultivating parallel with the trenches.

It is recognized by all who have work to do on the land in the tropics that provision must be made for dealing with storm water, in addition to the provision made for draining the land to fit it for bearing crops. Even if it were possible to develop satisfactory systems of subsoil draining, as may be the case, the question of dealing with the storm water will still have to be faced. This storm water is bound to pass over the surface, and in this manner find its way to the drains. It is essential that this passage over the surface shall be as short as possible; if any long path is traversed, either the flow will be sluggish and the land will be water-logged, or the flow will be rapid, in which case the land is sure to be cut up, and the cultivation damaged.

In many cases connected with tropical crops it is the custom to throw the soil into ridges and furrows; this is often the case with such crops as sugar-cane, cotton, corn, and others. When these banks or ridges run parallel with the main drains they present great obstacles to the flow of water across them into the drains, so the water must run down the furrows until it finds the outlet; in this way considerable distances have to be traversed, and the land is liable either to be water logged or cut up.

In a lesser degree the operations of tilling and weeding by implements running parallel to the main drains give rise to minor ridges also parallel to the main drains, and conduce, in a minor degree, to the troubles referred to.

It is often argued that with good tilth the whole of the water should find its way through the soil, beneath the surface, across the banks, and into the drains. Where the rainfall is moderate this may be the case, but in the tropics there is always the liability to heavy downpours of rain, when the storm water must flow over the surface. It may be possible to attain a considerable degree of success in this method of parallel cultivation for some time, perhaps for a season or two, if no heavy rainstorms are encountered; but once a heavy storm comes there is grave danger of injury. The planter who experiments under the former condition may feel that the method is successful; the one who meets with the latter knows that it is disastrous.

It is thought that the differences of opinion on the subject may largely arise from considerations such as those noticed above.

It is admittedly desirable to introduce and encourage the use of motor tractors for ploughing, and of implements for cultivating and weeding, and to find means of negotiating the necessary storm water drains. Some attempt is being made to do this by endeavouring to construct motors and implements which will cross the drains.

In the meantime it will doubtless be necessary to endeavour to develop the practice of ploughing and cultivating parallel to the main drains. In this case it seems essential to recognize the fact that storm water must be reckoned with, and that it must flow over the surface by reasonably short routes. This means that, on heavy land particularly, ridges and banks parallel to the main drains must be avoided. This can be achieved by throwing the land into broad, sweeping ridges between the main drains and parallel with them, so that any storm water falling on these broad ridges can flow directly into the main drains without having to run for any distance parallel to them. This practice of broadly ridging the land is well seen in English agriculture, and is practised in a modified form in most of the West Indian colonies, being intended to throw the water into the drains. It would appear well worth while to experiment in this direction in connexion with cane cultivation on some of the heavy West Indian soils. By suitable methods of ploughing, the land should be thrown into broad smooth ridges between the main drains, and it should be seen that the curve of the surface is regular. The canes should then be planted in rows, parallel with the drains, care being taken in planting to preserve a reasonably smooth surface, that is to say, the formation of a series of small ridges is to be avoided as far as possible. Under such an arrangement the cultivating and weeding may be readily accomplished by animal-drawn implements.

In this connexion it would seem that only one of two methods of putting in the plants is likely to be successful if the formation of a number of small ridges is to be avoided. Either the plants must be put in on the flat, and the surface of the bed preserved in as smooth a condition as possible, or perhaps a modified system of planting in separate 'cane holes' might be found practicable, thereby avoiding the surface washing to be feared as a result of a heavy downpour of rain.

The main drains must be spaced at such distances as will provide adequate drainage, according to the nature of the soil. In very heavy soils they will have to be somewhat close together, or drainage will be imperfect.

In view of the interest that is being taken in this subject at the present time, it would serve a very useful purpose if trial along the lines suggested were made extensively in several of the colonies.

F. W.

LIME CULTIVATION IN DOMINICA.

(*Concluded.*)

IV. PROPPING OF LIME BRANCHES AND YIELD OF LIMES.

The following is the conclusion of the extracts from Mr. J. Jones's Report, other portions of which have appeared in the three previous issues of this Journal:

Propping of lime branches during crop.—This operation is carried on to a considerable degree on some properties. Whether it is really needed to the extent that it is carried on, and whether the expenditure which it involves is altogether sound, are sometimes subjects of discussion amongst planters.

There can be no doubt that the propping of branches on some old plantations is necessary. This is due in many cases to too close planting, which, in the struggle for light, results in the production of elongated branches which cannot possibly carry the weight of fruit without being bent to the ground or broken. As long as the trees are young, support is not required to any extent, but, as the inevitable vacancies occur in the fields, whether caused by hurricanes or disease, the need of propping increases as time goes on.

On old plantations in which the proportion of diseased trees is high, and especially in cases in which the wood of the base of the trunk and of the main branches is affected by decay, the need of supporting the branches during crop is apparent to all. Trees so affected are doomed, although several years may elapse before death takes place. During this period good crops are borne, and even heavy crops in the case of fields which are manured. In these instances support of the branches is needed and is usually given.

Propping is also largely practised in the case of trees growing along the public roads, estate roads, and paths. The object is in most cases twofold: (1), to press the branches away from the roadsides, and (2), to afford support, as the trees grown under these conditions usually bear well. In the case of public roads inconvenience is often caused to travellers by the reluctance of some planters to cut back or to prop back the branches of what are considered by many owners to be their best trees, for in unmanured fields the best specimens are usually found on the edges of the cultivation. This is due to the fact that the trees get room and light for development, and they also receive from time to time a top dressing in the shape of scrapings from the road drains. If therefore the additional room and light, and the occasional top dressing result in the production of good trees, surely it affords at the same time a lesson in cultural matters which should be learned and followed.

The need of supporting and pressing back branches along roadsides could be overcome in future by taking care to plant sufficiently far back to allow of the full development of the trees without interfering with the rights of the public, and on estate roads and paths it is apparent that planters reap no advantage whatever, but it is probable that they are the losers in the long run by the practice of planting on the boundaries of public highways and on the edges of estate roads.

Generally speaking, this work of propping is largely due to preventable causes. Sound, healthy trees, properly spaced, can carry their crops without assistance, just in the same way as orange and grape fruit trees do. To space the trees properly, and to prune soundly, will greatly reduce the need of supporting the branches. Owing to lack of forethought this work has become a considerable item of annual expense on a number of estates. While propping must be continued in old fields, new areas of limes should be treated with the object of reducing to a minimum this item of annual expenditure.

And there is another aspect of this situation: a lime tree propped is nearly always a lime tree injured. The work is usually badly done, and by the time the prop has decayed or been removed, the bark has been rubbed off the branches owing to swaying caused by the wind. As old trees cannot callus over the wounds, decay of the wood follows, and the branch will at a later time break off at the point of injury. That some crop is saved by supporting the branches is undoubted, but this is only accomplished at the cost of permanent injury to many of the trees.

Yield of limes.—Although lime cultivation was taken up in Dominica over sixty years ago, and developed with considerable energy during the past twenty-five years, the possible annual yield of fruit per tree over a series of years, in the best positions, and under good handling, does not appear to be known, nor does this point excite much interest. Compared with the returns of orange and grape fruit trees, the best yield of lime trees recorded per acre in Dominica appears low. The average crop of orange trees, under good cultivation, is from 800 lb. to 1,000 lb. per tree, while the best recorded crop of limes is 200 barrels per acre, which, allowing that the trees are spaced at 20 feet, gives a yield of only 320 lb. of fruit per tree. In this connexion it has to be remembered that the proportion of juice from a given weight of fruit is higher in the case of the lime than the orange. Still it is evident that lime trees in good positions, properly spaced, and given a complete manure annually, are capable of giving a higher return than 200 barrels of fruit per acre.

On estates which are regarded as doing well, a crop of 150 barrels of fruit per acre is considered good. There is, however, a good deal of cultivation on which the return is below 100 barrels of limes per acre.

Under the best cultural conditions there would always be some variations in yield, according to position of the estate. It is obvious that a lime estate in the mountains, at an elevation of 1,800 to 2,000 feet, can hardly be expected to produce on the same lines as well sheltered estates located in the hot moist valleys near to the coast, but by a general improvement of cultural conditions the average yield of plantations could be raised considerably above what it is at present.

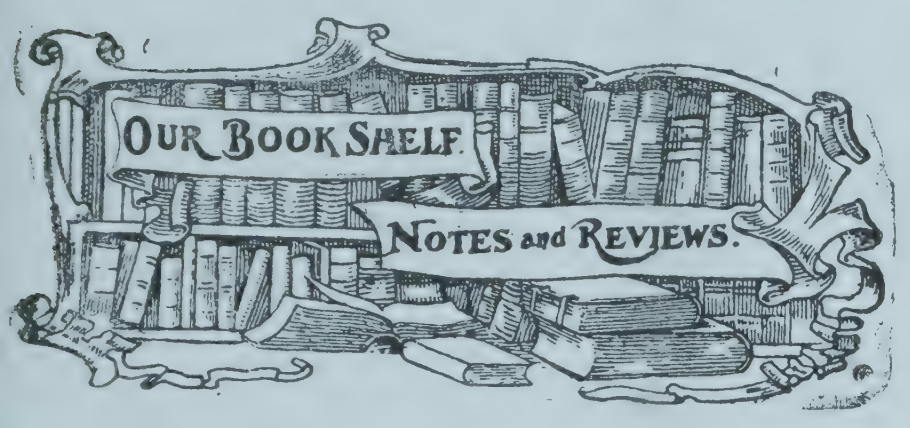
While the crop is, in the main, limited because of the lack of good husbandry, an additional cause of low returns is the overcrowding of fields. If trees were properly spaced according to location, these should, when fully developed, stand clear of their neighbours. The bearing area of the trees is, under such conditions, greatly increased. Overcrowding the area limits bearing. Close planting, however, is not without its advocates, one of the arguments put forward being that during hurricanes close planted trees support one another, and prevent overturning. Fortunately, hurricanes are of rare occurrence, and a policy which permanently reduces the bearing area of trees by over 50 per cent. for this reason, appears to be an over cautious one.

In connexion with this question of yield, it is somewhat surprising to find at the present stage of the industry that no area of cultivation exists in the island which has received a complete manure of nitrogen, phosphates, and potash annually for a period of five successive years, or a suitable application of pen manure or mulches over a similar period. Only by the annual application of complete manures, backed by good cultivation, can it be found out what the lime tree is capable of yielding in fruit. The results under indifferent cultivation are well known. Let it be hoped that the time has now arrived for greater effort in the improvement of plantation work. In the trying times that are ahead, the interests

of Dominica would be best served by methods which would quickly increase the returns per acre on established estates, rather than by new plantings which would take a number of years to mature. Important as is development work on all estates, this line of activity might very well be put aside on old estates in Dominica for a few years, in favour of intensive methods of cultivation.

While this lack of systematic manuring of lime trees after so many years is remarkable, the candid critic would also point out that the starting of an Experiment Station only five years ago, and then only in a small way, is equally remarkable in the history of the lime industry of Dominica, when so many problems affecting this cultivation have so long required investigation. These matters show the general lack of interest in all measures appertaining to an intensive system of agriculture.

The distances of planting at the Experiment Station range from 15 feet on steep slopes to 20 feet, 25 feet, and 30 feet in more favourable situations. In due time records of the results in yields of fruit in these spacing experiments should be forthcoming.



NATURE TEACHING, Based upon the General Principles of Agriculture for the use of Schools. By Sir Francis Watts, K.C.M.G., D.Sc., F.I.C., F.C.S., Imperial Commissioner of Agriculture for the West Indies. Fourth and Re-enlarged Edition. Pp. VII + 214. Price 2*s.* 6*d.* net. *Published by His Majesty's Stationery Office.*

The issue of a fourth and considerably enlarged edition of this valuable book affords an opportunity of reviewing not only its contents, but also the purposes for which it is intended.

From the establishment of the Imperial Department of Agriculture for the West Indies it has consistently advocated the importance of instruction in the principles of agriculture both in the elementary and secondary schools of these colonies. In 1901 Sir Francis Watts, who was then Government Chemist and Superintendent of Agriculture for the Leeward Islands, issued the first edition of this book which was intended to qualify elementary school teachers to give the right kind of instruction including practical demonstration work. That the book fulfilled its purpose is shown by the fact that a second edition, enlarged and improved, was issued in 1908, and a third edition, also enlarged and revised, in 1911. That edition having been exhausted, and the demand for the book continuing, the printing of a fourth edition is especially welcome.

To those familiar with previous editions it need not be said that the book is written in a very clear and interesting style. The information given is well selected, and its arrangement is thoroughly adapted to the assistance of teachers of the subject.

The first chapter deals with the seed and the conditions for germination. This is followed by chapters on the root and its parts; the stem and its structure, with illustrated descriptions of the methods of grafting and budding; the leaf, its structure and uses, with the relation of plants to the atmosphere and water, and the food of plants; the soil and its composition; manures, their composition and their use; flowers and fruit, with a note on variations in seedlings; weeds; and finally, the two last chapters deal with insects and fungi, with notes on general methods of combating pests and diseases of plants.

The importance of practical work in agricultural education is kept always in view, and at the close of each chapter a series of exercises and experiments is given to illustrate the principles discussed. At the end of the book there is a useful glossary of scientific terms employed, together with seven appendices dealing with the local habitats of plants, the classification of simple leaves, description of certain flowers of curious shape, the classification of fruits, a table showing the number of plants to the acre at various distances, a list of useful books, and a list of appropriate tools and appliances; all of which are calculated to be of use to the teacher.

In this edition some additions have been made, among which may be mentioned a note on Mendelism, on page 125, and some additional remarks concerning leaves and their function in Chapter IV. Some extension of the experimental work on the soil has also been made. The chapters on insects and fungi, the author says in the preface, have been rewritten to bring the information into line with recent ideas and developments. To the list of plants in the appendices the names of some interesting species formerly omitted have been added, and the information dealing with plant habitats has been revised.

It may be pointed out that Nature Teaching is not intended as a class reading book, but for the guidance and information of school teachers. In this connexion attention may be directed to Pamphlet No. 82 of this Department, entitled Indoor Gardening for Schools. This pamphlet, if used in conjunction with Nature Teaching, will be found a useful help in arranging practical indoor gardening work, for the instruction more especially of the junior classes in schools.

In conclusion, the continuous demand for new editions of this book is a gratifying sign that the teaching of agricultural science is gaining in popularity among school managers and teachers in these islands. Although written originally with a view to the needs of teachers in the West Indies, Nature Teaching might with advantage be employed in a similar way by teachers throughout the tropics. This wider use is facilitated by the book being now published by His Majesty's Stationery Office, and thus easily obtainable everywhere. C.H.B.

An article on the preservation of perishable products with burnt lime, in the *Queensland Agricultural Journal*, February 1919, states that fully matured sweet potatoes have been kept for six months simply packed in air-slaked lime. Last season a test was made of using less lime, and substituting sand in the proportion of 1 of lime to 4 of sand. The potatoes were first rolled in lime, and then packed in a wooden case (not air-tight) with the above mixture. Five months afterwards potatoes so treated were quite as fresh as when first packed. The cost of the lime used for such a purpose would be almost nil, as it can afterwards be applied to the land with considerable advantage.

MARKET REPORTS.

London.—The West India Committee Circular, March 20.

Balata—Venezuelan Block, 3*s.* 3½*d.* to 3*s.* 4*d.*; Sheet, 4*s.* to 4*s.* 1*d.*
Beeswax—No quotations.
Cacao—No quotations.
Copra—£37 to £37 10*s.*
Honey—West Indian, no quotations.
Lime Juice—Raw, 2*s.* 9*d.* to 3*s.* 6*d.*; Concentrated, no quotations.
Pimento—No quotations.
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, March 24, 1919.

Bay Oil—Lower, at 13*s.* to 14*s.*
Lime Oil—Slow, at 4*s.* 9*d.* for West Indian distilled, and 13*s.* for hand-pressed.
Orange Oil—West Indian, 7*s.* 6*d.* per lb.

Barbados.—Messrs. T. S. Garraway & Co., May 15.

Arrowroot—$8·60 per 100 lb.
Cacao—$17·00 to $18·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—No quotations.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—Dark Crystals, $5·50

Trinidad.—Messrs. Gordon, Grant & Co., April 2.

Cacao—Venezuelan, $17·75 to $18·30; Trinidad, $17·00 to $19·00.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 18c. per lb..
Copra—$3·50 per 100 lb.
Dhal—No quotations.
Onions—$10·00 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $4·00 per 100 lb.
Rice—Yellow, $14·00; White, $9·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros & Co., April 17.

Cacao—Caracas, 18¼c. to 18½c.; Grenada, 17¾c. to 18c.; Trinidad, 18½c. to 18¾c.; Jamaica, 15½c. to 16c.
Coco-nuts—Jamaica selects, $60·00; Trinidad $60·00 culls, $40·00 per M.
Coffee—Jamaica, 18¼c. to 20½c. per lb.
Ginger—15c. to 17½c. per lb.
Goat Skins—Jamaica $1·10; Antigua and Barbados, 95c.; St. Thomas and St. Kitts, 95c.
Grape Fruit—Jamaica, $4·50 to $5·00.
Limes—Nominal $6·00 to $8·00.
Mace—38c. per lb.
Nutmegs—20c. to 21c.
Oranges—$3·50 to $4·00.
Pimento—7½c. per lb.
Sugar—Centrifugals, 96°, 6·90c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

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BOTANICAL STATION ... LAL-BAGH, BANGALORE

CONTENTS.

	PAGE.		PAGE.
gricultural Examinations, 1918	175	Items of Local Interest ...	166
griculture in Barbados	167	Lime Cultivation in Dominica	165
amphor Cultivation in the British Empire ...	173	Limes, Green, Condition when Shipped	169
co-nut Industries of Trinidad	163	Market Reports	176
otton:—		Notes and Comments ...	168
Cotton Exports from the West Indies ...	166	Plant Diseases:—	
Sea Island Cotton Market	166	Investigation of the Froghopper Pest and Disease of Sugar-cane	174
epartmental Reports ...	164	Plant Legislation in Grenada, Recent... ...	169
dex to the 'Agricultural News'...	168	Plants Poisonous to Stock in Antigua	168
fusorial Earth as a Fertilizer	171	Rainfall in St. Kitts, Abnormal	168
sect Notes:—		Retrospection	161
The Cotton Worm ...	170	Sucrose Content of Canes, Deterioration in	169

Retrospection.

PERHAPS one of the commonest definitions of the present age is that it is an age of progress. This is undoubtedly true, espeally with regard to all matters affecting the material onditions of human life in general. The amelioration these conditions is due in a large measure to the rogress of scientific discovery.

In the first place, the progress that has been ade in all directions in mechanical devices has been ne of the most remarkable features of late years. The scovery of the possibilities of the employment of eam power was perhaps the greatest note of progress in the last century; but the present day development of internal combustion engines, and of electricity in its many aspects, marks a still more remarkable step forward.

In the second place, as regards the application of science to agriculture, the progress made in this connexion in the past half-century is hardly less than that made also in mechanics. The possibilities of production in all agricultural industries have been wonderfully enlarged and organized.

All this progress has undoubtedly led to such a feeling of exhilaration and expectancy as regards the future that there seems to be a general feeling of what may be called impatience. Always to be hurrying forward with new ideas, always to be striving to obtain new results may be said to be the tendency of most experimenters and investigators at present. It is true that this can be considered to be, in a way, the very business of such experimenters and investigators, but when the tendency is carried so far as to lead to the opinion that a new theory is necessarily a true one, or that new results obtained from some new process are, because of their novelty, a great improvement on all results obtained from past experience, such tendency may result in hindrance to real progress.

The most lasting progress in any direction usually follows from a careful retrospect of results already obtained, and a careful comparison of these with present observations. By such retrospection and comparison it would be easier to guide thought and practice into valuable progressive channels for the future.

Another aspect of this hurry to obtain new results is that it leads often to an individualism which tends to waste of time, thought, and energy on the part of scientific workers. Want of knowledge of what has been achieved in the past in any line of research or endeavour causes a regrettable repetition of work. Instead of starting fresh work from points already reached, a worker regardless of the past does the work over again, only to find that his own labour is redundant or incomplete. However much knowledge one man may possess, he cannot afford to ignore the accumulated knowledge and experience of the workers of the past, and of other workers in the present. This is an attitude of mind which affects in some degree the work that is going on in these colonies, amongst other places, in connexion with the desire to foster developments and improvements. This attitude is concerned with the tendency already noticed of continually pressing forward, and of being concerned with the work only of the present and the future, to the neglect of what has gone before. Much that has been done in the past with regard to agricultural research in these islands deserves more consideration than it receives in the pressure of modern life to get ahead. Necessary as it is to look ahead, it is equally essential to look back.

To correct this tendency, or rather to give it its proper balance—for there is much of value in the desire to go forward rather than to stand still—it is well that time should be devoted to the study of all available information on the subject in which interest is being taken or investigation made. Nowadays there is such an immense volume of literature bearing on agriculture, consisting of reports of experiments and investigations in every direction, that a worker or student ought to consider himself very poorly equipped for excursion into the vast field of what is still unknown, unless he makes a starting point from what has already been observed and recorded. This requires patience, and also a certain humility of mind, both of which qualities have been characteristic of all great pioneers in the world of science.

These remarks are prompted partly by consideration of the work that has been done in the past in connexion with local agriculture by many of the West Indian agricultural departments, and by the valuable information which has been recorded in departmental publications. A little research amongst these makes it evident that they contain much that is in danger of being forgotten, and that they contain indications as to lines of progress which may be in danger of being overlooked. A reperusal of them would doubtless prove stimulating to present workers on similar lines.

Another corrective of haste in forming conclusions on incomplete generalization will be the patient revision of the worker's own work. An old Latin proverb has it that no man is wise at all times; even the wisest are liable to make mistakes, especially in first experiments. The continued revision of facts and figures, observations and results, testing these in as many ways as possible, although perhaps irksome at first to the young and ardent student, leads to a very secure foundation of knowledge, and to the ability of becoming a trustworthy guide for others in progress in science and in the arts.

Besides revision of work done, time ought also to be devoted—much more time probably than is often so spent—in calm reflection over the results obtained, and in contemplation of the direction to which these results point.

It would seem certain that careful study of records of the past, patient revision of work done, and calm reflection on results obtained will be an adequate means of preventing experiments and investigations being ephemeral, and of little value. Such habits of mind and of study will do much to advance science and practice on the surest lines of progress. Responsibility lies upon those for whom this work is done to insure that the workers have time to think, and that they use it in thinking.

There is another tendency, which the above mental habit would do much to correct, namely to look for quick returns from research. Here it is not the men who make researches who are to be blamed, but those on whose behalf and for whose benefit the research is being made, who often press for immediate results. To take as an instance a matter affecting all agriculture, and not least, that in the West Indies, experiments and researches with regard to the effects produced upon different soils and crops by the use of various manures. Often the farmer or planter complains because no definite decision can be given by his scientific adviser on a particular instance in this connexion. He has to be told that to obtain reliable information experiments have to be conducted over a series of years, and under varying climatic and other conditions. In haste and disappointment the agriculturist is often led away by specious advertisements to believe that some particular combination of fertilizers will benefit every crop under every condition. Experience usually teaches him his mistake. On the other

hand, if he would carefully study the records available—and there is no lack of them—if he would remember the limitations of his scientific advisers, and if he himself would patiently revise and think over results already obtained, he too would be in the way of making good and lasting progress, not only with respect to the proper manurial treatment of his crop and soil, but also with regard to many other questions affecting the art of agriculture to which his life is devoted.

THE COCO-NUT INDUSTRIES OF TRINIDAD.

In an interesting article under the above title, which appeared in *The Board of Trade Journal*, February 20, 1919, much of which is reproduced below, it is stated that the coco-nut estates of Trinidad, confined within comparatively small portions of the island by the sea-coast, are yielding greater profits on the capital invested in them than any other agricultural industry in the island. With constant planting of new trees, the industry, it is considered, is bound to expand in importance during the next few years.

During the year 1917, the export of coco-nuts from Trinidad amounted to 16,595,282 coco-nuts locally grown, and also 760,430 foreign coco-nuts, chiefly Venezuelan. Most of these were shipped to the United States, the figures being 13,867,655 coco-nuts, valued at $398,912, and 696,100 Venezuelan coco-nuts, valued at $22,806.

The exports of copra in 1917, according to the United States 'Commerce Reports,' amounted to 7,201,448 lb., of which 3,277,258 lb. were exported to the United States. All the copra exported from Trinidad during that year was produced locally.

Trinidad produces approximately 140,000 gallons of coco-nut oil a year for the consumption of the local population, especially the East Indian coolie classes, who use it both as food and as lotion for their bodies. The amount of coco nut oil produced depends to some extent on the relative price of copra, for when the export price of copra offers more profit than the manufacture of the same into coco-nut oil, the owners prefer to sell the copra for export.

Coco-nut trees are to be found practically all round the coast, but the production is concentrated chiefly in two districts: one, the Cedros district, has about 9,640 acres, 7,000 of which are bearing, and the other, the Mayaro district, has 7,500 acres in trees, all bearing coco-nuts. The island of Trinidad altogether has about 27,000 acres in coco-nuts, one-third of which is probably not yet bearing. The island of Tobago has now about 9,000 acres under this crop, but only a very small proportion of trees are bearing.

There are about 21,000,000 coco-nuts produced annually in the Cedros district, of which approximately 16,000,000 are grown on large estates owned by English companies, or planters of French and English extraction, and about 5,000,000 on small estates owned chiefly by East Indians and negroes. The cost of working these small estates is considerably more per acre than that of large estates. Large estates vary from 800 to 1,600 acres, and small estates from 10 to 100 acres.

Next in importance to the Cedros district is that of Mayaro, which covers about 17 miles of the southern part of the east coast of Trinidad, with an extent inland of about a quarter of a mile. Some 12,000,000 coco-nuts are produced annually in this district, but the nuts are smaller than those produced in the Cedros district. The soil conditions are less favourable, and only about 20 per cent. of all the coco-nuts produced are within the two classes desired for import into the United States as nuts. The remaining 80 per cent. are used for copra and coco-nut oil, the shells serving as fuel for the manufacture.

In the Mayaro district there are three factories, each of which makes use of 7,000 coco-nuts per day for the manufacture of oil. The total output amounts to about 100,000 gallons per year. about 500,000 lb. of coco-nut cake, sold mostly in T for feeding stock. Probably about one-half of all the coco-nuts produced in this district find their way into these three factories for making oil, but this depends on the relative price of copra.

An analysis of coco-nut products was made at a factory in Port-of-Spain, the nuts having been delivered whole to the factory for this purpose, although usually only copra is brought there. This analysis revealed that 1,000 selected nuts, weighing 1,491 lb. in the shell, yielded 735 lb. of green copra, 446 lb. of shell, and 310 lb. of water; the green copra yielded 440 lb. of dry copra. The same number of culls, weighing 1,043 lb. in the shell, yielded 326 lb. of shell, 189 lb. of water; and 528 lb. of green copra, or 318 lb. of dry copra. The 2,000 coco nuts yielded 45 gallons (imperial) of coco-nut oil, averaging 6 gallons per 100 lb. of copra, and 290 lb. of coco-nut meal. The factory ordinarily uses 20,000 lb. of copra every week, making 1,200 gallons of oil and 10,000 lb. of meal. Besides coco nut shells, wood, and coal, a good deal of sawdust, obtained from a saw-mill in the vicinity, has been used for fuel.

In addition to copra and coco-nut oil, the coir fibre of the coco-nuts is also a source of revenue in connexion with the coco-nut industry of Trinidad, notwithstanding the fact that a vast amount of this fibre is wasted on husks thrown away or used only for fuel. At the gaol in Port-of Spain, prisoners have an industry of making mats from coco nut fibre, these being used for household purposes, for motor cars, etc. In Port-of-Spain there is also the West Indian fibre factory, employing about fifty persons, including sixteen machinemen, with an average output of between 6 and 7 tons of fibre per week.

In addition to the coir-fibre factory at Port-of-Spain already mentioned, there is another plant existing for such purpose on the Cedros Peninsula, which, with four machines, can use the fibre from about 2,000 coco-nut husks per day. It has been temporarily closed on account of the difficulty of shipping the fibre.

There is the utmost feeling of confidence in Trinidad in the future of the coco-nut industry; and it is believed that there will always be an active world demand for coco-nut products, especially copra, in connexion with the increasing use of margarine.

Prof. H. Maxwell-Lefroy said at the Royal Institute on February 27, 1919, that there were three kinds of silk produced in India from insects living wholly or partly in the forests. These were the 'tussore' silk, which came largely from China and Japan, but the adult insect lived in the forests of North-West India; secondly, 'miga' silk, produced chiefly in Assam; and thirdly, 'Eri' silk, which comes from caterpillars which feed on the castor oil plant. This last is of great value in India because it is the only silk which can be spun from cocoons without killing the insects in them, and is therefore the only silk that a strict Hindoo can wear. (*The Times*, February 28, 1919.)

SEYCHELLES: ANNUAL REPORT ON AGRICULTURE AND CROWN LANDS FOR THE YEAR 1917.

This report by Mr. P. B. Dupont, Curator of the Botanic Station in the island of Mahé, the chief island of the group, has recently been received. As usual it contains matter of considerable interest, especially to West Indian agriculturists, seeing that the climatic and soil conditions of that group of islands are very similar to those in the West Indies; especially, does the comparison hold good between Mahé and the more mountainous islands, such as Dominica and St. Lucia.

It seems that, as has been found to be the case in Dominica, the mangosteen (*Garcinia mangostana*) and the durian (*Durio zibethinus*) the well-known East Indian fruit trees, are more at home on the hills than in the low country, though both of these trees have fruited in the year under report. Another interesting tree, the seeds of which were introduced from Java in 1912, has also produced ripe fruit at the Botanic Station in 1917. This is *Sandericum radiatum*, belonging to the same order of plants, Meliaceae, to which the mahogany also belongs, but unlike the latter it bears a large fruit of the diameter of nearly 3 inches, which contains a sweet pulp inside, arranged somewhat like that of the mangosteen or the West Indian star apple (*Chrysophyllum cainito*). Besides producing an edible fruit, Mr. Dupont states that it is an excellent shade tree, with a dense head, and very ornamental, owing to the fact that the old leaves turn red before falling. It may be mentioned that another species of the same genus, the fruit of which is also edible, although reported to be of a somewhat unpleasant odour, is grown in the Botanic Gardens at Dominica.

Another tree of great economic importance was introduced during the year through the United States Department of Agriculture; this is the algaroba (*Prosopis juliflora*), which is grown extensively in Hawaii, and the beans of which are used as food for cattle, pigs and poultry. For this reason Mr. Dupont considers that the introduction of the tree into the Seychelles will be of much benefit. It might be suggested that the Jamaica shade tree or Guango (*Pithecolobium Saman*) might also be advantageously introduced from the West Indies into the Seychelles.

A large portion of the report is taken up with the account of experiments in the cultivation of the oil palm (*Elaeis guineensis*) which has been introduced from Nigeria, and which promises to develop into a considerable industry. The plants hitherto introduced have done well even in comparatively poor soil, but it seems likely that the yield of the trees will be considerably affected by the nature of the land. The oil palm tree, like the coco-nut, seems to grow well on coral land, and the few plants set out in 1913 on such coral lands have flowered as early as those on granitic land. The coco-nut palm plantations in Seychelles have been so much damaged by pests and diseases that another palm of the same hardy type as the coco-nut will be a useful adjunct in the Seychelles plantations. Palm oil trees are produced so easily by seeds that the trees may very likely become spontaneous on abandoned or waste land, and it is important to have in an undeveloped colony like the Seychelles a crop which can be grown easily without much trouble. Experiments are being undertaken with regard to the investigation of the question whether the soft-shelled variety of the oil palm breeds true, as this variety is more desirable for cultivation on account of the less labour in breaking the nut.

Further experiments are being conducted on the manuring of coco-nut trees, the records of which will be of considerable value when conducted for a sufficient number of years, as it is supposed that the influence of manures cannot show itself before at least two years after their application.

A declining industry is vanilla, which at one time formed a large proportion of the exports. The declared value of the amount of vanilla exported in 1917 was 50,000 rupees, whereas twenty years ago the value of the vanilla crop exceeded 1,000,000 rupees. Four causes for this decline are stated in the report: (1) reduction of area planted owing to the seven years of drought which lasted from 1904-11, the vanilla orchid being unable to stand such continued dry weather; (2) the increasing interest in coco-nut planting which has become of late years a more paying industry than vanilla; (3) disease caused by the Calospora fungus; (4) the exhaustion of the soil by repeated culture of vanilla on the same land.

The rubber industry appears to be progressing satisfactorily. New areas are being opened up for rubber planting, and it would seem as if rubber will take the place in agriculture which vanilla had formerly. The Hevea rubber tree thrives in the lateritic soils of the Seychelles, and up to the present has proved remarkably immune from disease.

Another growing industry is that of the distillation of essential oils, especially cinnamon leaf oil. This industry was established in 1907 after three years of experiment. There are at present no less than seventeen distilleries at work, and the development of this new industry is largely benefiting the poorer classes. This will be seen from the fact that a distillery working 45 tons of cinnamon leaves a month, gives employment to about ninety persons. With regard to the yield from the cinnamon leaves, it is stated to be very variable according to the time of the year and the age of the leaves. The yield varies from 4 to 8 kilogrammes per ton of leaves. The work continues all the year round, and there are enough cinnamon trees growing on the hills in Mahé to allow of several more distilleries being put up. In the Government forests there are some huge trees, said to be more than 100 years old, and from these, seeds are scattered all over the islands by wild pigeons and mynah birds, which are very fond of the succulent berries.

As in other outlying portions of the Empire, the production locally of an increased quantity of foodstuffs was a pressing question in the year reported on, and various crops were advised to be planted. These are similar to food crops grown in the West Indies. One or two however seem strange. It is stated, for instance, that the labourers eat the leaves of the cassava. The young shoots are pounded and squeezed to extract the juice, and then cooked with saltfish and is greatly relished. The boiling also as a vegetable of the unripe fruits of the granadilla (*Passiflora quadrangularis*) and the use as a spinach of the leaves of the horse radish tree (*Moringa pterygosperma*), as well as the use of the unripe pods as a string bean, seem also peculiar. The flowers of the same tree, as well as those of *Sesbania grandiflora*, another well-known tree in the West Indies, are both of them used as vegetables. It

would be interesting if experiments on these lines were made in these islands, and the results reported, the two plants in question being neither of them poisonous. It would be advisable, however, to be cautious in experiments with cassava leaves, on account of the hydrocyanic contents of the plant.

LIME CULTIVATION IN DOMINICA.

GREEN DRESSING AND DUST MULCHES.

As an addendum to the series of articles which have been reproduced in recent issues of this Journal from the Report on the Agricultural Department, Dominica, lately issued, the following remarks are taken from another portion of the report, which give further information on green dressings best suited for use in connexion with lime trees:—

Green dressings. During recent years over thirty species of green dressings have been grown with a view to finding which are best suited as nurse plants in young lime cultivations. There are many kinds of green dressings, and all possess a value under certain circumstances, but the ideal nurse plant and soil enricher for young limes should be a biennial, with a bush-like habit, which would give a good cover, grow to a height of 4 or 5 feet, with a life of eighteen months or two years, or even longer. To possess seeds of a fair size, with good germinating power, which could be easily collected, is another desirable quality.

At present this ideal plant has not been found. The most useful grown in the Experiment Station have been the Tephrosias, particularly *T. candida*, which has afforded a good cover for a period of two years. The several species of Indigofera have also considerable possibilities in this direction. In both cases mentioned above, the seeds are small, and difficult to collect and clean. The Tephrosias are also very uncertain as regards germination. The pigeon pea (*Cajanus indicus*) has its uses in this direction, but it is not sufficiently dense-headed to prevent the grass from growing below, though it weakens the latter considerably.

For covering the ground, several species of Mucuna (Stizolobium) and other peas and beans have been found suitable, but the tendency of this class of plant to climb and cover the young lime trees is a drawback in Dominica. Besides, lime plants require more than a ground cover. They need shelter, and this is afforded by the Tephrosias and Indigoferas, which attain a height of from 5 to 6 feet or more. The combination of ground cover and shelter is a great help to the limes at a critical period of their existence, that is, when between the age of two and five years.

For a ground cover, the horse bean (*Canavalia ensiformis*) has proved very useful. It has been found to do best when sown with the rains in May. It then grows vigorously through the wet season, giving a fairly good cover until November. If sown at later periods of the year, it commences to flower and fruit early, which causes the foliage to remain thin and unsatisfactory. It can be grown at any season for the production of seeds. As a cover plant, the best results are obtained by sowing with the rains. The same remarks apply in the case of Tephrosias. The best results, both of germination and growth, are obtained by spring sowings.

It is generally held that the growing of green dressings amongst young limes on estates is too costly. To prepare the surface of the soil for the seeds does cost considerably more than an ordinary weeding, but if a good growth of Tephrosia follows, the planter is relieved of weeding for a period of eighteen months, during which time the soil is protected and enriched, and the plants nursed and kept in a healthy and growing condition.

Lime trees at the Experiment Station, with Tephrosia as a nurse plant, are at four years from planting, from 12 to 14 feet in height, and are bearing heavily. Other trees of the same age, grown without green dressings, are only half the size, and not likely to fruit for some time.

It is clear that great advantages follow the use of leguminous plants with a bush-like habit in young lime cultivations.

Trials with new green dressings during the year were few. Seeds of the sunn hemp (*Crotalaria juncea*) were received from St. Kitts. This plant grows and seeds well, but it is too short-lived to possess any considerable value in orchard cultivation. Towards the end of the year seeds of *Crotalaria usamaroensis* and *Centrosema Plumieri* were received from Java, and are now under trial.

Since the foregoing was written, Mr. Jones, the Curator of the Botanic Gardens, Dominica, has furnished a note on the possible advantages of employing dust mulches in the cultivation of lime trees. This, as bearing on the whole question, is now reproduced below:

The dust mulch. Another form of mulching, which appears to be unknown to lime planters, is the dust mulch. By this is meant the working or stirring of 2 or 3 inches of surface soil in arable cultivation. By this means the capillarity of the soil is broken, and the evaporation of water considerably retarded, much to the benefit of the plants growing upon it.

In orchard cultivations the spreading over the surface of a thin layer of soil, such as is obtained in making or scraping drains, has the same effect, and this saving of water enables the trees to pass through considerable periods of drought with less suffering than in cases in which no mitigating work is undertaken.

Some surprise may be expressed as to any reference of the need of a dust mulch in a rainy country like Dominica, but, as lately experienced, very severe droughts may occur along the leeward coast, which is the main producing area of the island. Plants which are accustomed to an ample rainfall suffer severely during prolonged periods of dry weather, and any method which tends to mitigate such conditions, and which can be put into effect easily is worthy of consideration,

Experience recently gained in the Experiment Station shows that planters are well advised to carry out such instalments of draining as are necessary during the early and dry part of the year, and before the ground becomes very hard. The loose soil thrown out and spread over the land acts as a dust mulch, and proves effective during droughts. Lime plants, both young and established, treated in this way, show none of the signs of suffering exhibited by trees growing on land without this treatment.

It will be seen that properly laid out fields receive each year a top dressing as part of the annual routine work of cleaning the drains. This connexion between a good system of drainage and dust mulching is important in dry situations. Undrained areas lack this treatment, and the trees suffer considerably. In the latter case it is advised that the system of drainage by the instalment plan, as recommended in the note on drainage, should be carried out.

This matter of dust mulching while of interest on the leeward coast of Dominica is of far greater importance, and capable of a wider application in other islands in the West Indies in which limes are grown under much drier conditions of climate.

COTTON.

COTTON EXPORTS FROM THE WEST INDIES.

The following figures show the quantity and estimated value of Sea Island cotton *exported* from the West Indies for the quarter ended March 31, 1919 :—

Colony.	Quantity in lb.	Estimated Value, £.
Grenada	nil	nil
St. Vincent	141,785	23,578
Barbados	72,971	12,162
Montserrat	360,077*	59,952
Antigua	nil	nil
St. Kitts	160,462	24,069
Nevis	121,158	18,174
Anguilla	337	51
Virgin Islands 16,160† = 4,040 / 6,072	= 10,112	1,450
Trinidad	nil	nil
Total	866,902 lb.	£139,436

There were also exported from Barbados 3,263 lb. of linters, of an estimated value of £82.

Besides the above, 779 lb. of Marie Galante cotton, valued at £65, were exported from St. Vincent.

*The cotton exported from Montserrat comprised 359,417 lb. of clean lint, valued at 3*s.* 4*d.* per lb., and 660 lb. of stained lint valued at 1*s.* 6*d.* per lb.

† 16,160 lb. of Sea Island seed-cotton equal to 4,040 lb. of lint, which were shipped to St. Kitts.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended May 10, 1919, is as follows:—

ISLANDS. We have only to confirm our advices of the 3rd inst. The demand continues for Fine to Fully Fine at quotations, but the entire supply of this quality has been sold, leaving in stock only Planters' crop lots of Extra Fine, which are held at 5c. to 10c. higher.

We have also in stock several hundred bags of the lower grades, which can be bought to advantage with orders in hand, as the factors are desirous of selling.

We quote, viz:—

Fine to Fully Fine, @ 53½c., f.o.b. and freight.
Extra fine Planters' crops @ 62½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. Although the market is quiet, it remains firm, with holders unwilling to make any concessions in price, as they anticipate higher prices later on. The better grades, Extra Choice and Fancy, are in demand, but the offerings are very small, rendering it difficult to execute orders at quotations.

The expectation is that the Northern Mills will require very soon some further supply, and consequently the limited offerings will be sought after.

We quote, viz:—

Extra Choice to Fancy, 53½c., f.o.b. and freight.
Average Extra Choice, 52½c. f.o.b. and freight.
Extra Fine, 49c. to 50c., f.o.b. and freight.

The exports from Savannah for the week were, to Liverpool 25 bales, Northern mills 301 bales, and from Jacksonville to the Northern Mills 35 bales.

CROP ADVICES. We beg to refer you to our advices of May 3, which we confirm. There will be a large decrease in acreage planted, and the coming crop will fall short of this year's crop.

N.B —We will not issue our next circular report until May 31.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. In his notes for the month of April, Mr. A. J. Brooks, the Agricultural Superintendent, states that, besides the general routine work in the Botanic Gardens and Experiment Stations, the manufacture of farine and starch has been proceeded with. A course of agricultural lectures have been delivered during the month in Castries to the head teachers of the primary schools, nineteen of whom attended the course, together with some pupils of St. Mary's College, and a few of the general public. Plants distributed from the Department during the month, were : lime plants, 850 ; decorative, 25. The rainfall for the month at the Botanic Gardens, Castries, was 4·22 inches ; at the Botanic Station, Choiseul, 1·61 inches.

DOMINICA. In his notes of interest for the month of April, Mr. J. Jones states that 35 barrels of green limes and about 8 barrels of ripe limes have been reaped from the trees on the Experiment Station during the month of April. Nitrogenous manures have been applied to the plots, and a plot of camphor trees has been planted out. Plant distribution for the month consisted of limes, 150 ; budded citrus, 44 ; camphor, 30 ; miscellaneous, 48; onion seedlings, 5,000 ; together with 42 packets of vegetable seeds. The local price of green limes dropped from 25*s.* to 20*s.* per barrel ; ripe limes remained unchanged at 5*s.* per barrel, and raw lime juice at 9*d.* to 10*d.* per gallon. The agricultural pupils returned from their Easter holidays on April 23, and have been employed, in addition to ordinary agricultural operations, in pollinating vanilla flowers, and preparing Burgundy mixture The unusually long drought on the south leeward coast seems to be breaking up ; the rainfall for the month recorded at the Botanic Station was 2·36 inches.

MONTSERRAT. The planting of trial plots for comparison of St. Vincent, St. Kitts, and Montserrat cottons was facilitated by good rains at the end of April. Mr. W. Robson, the Curator, states that the recent results from the distillations of bay leaves have been good, ranging from 20 to 24 oz. of oil per 100 lb. of green leaves. Although the weather had been very dry on the leeward side of the island until the close of April, it had been much more satisfactory on the windward side, where the cotton crop is now well established. This crop has now made a fairly good start over the whole island. The juice of each of the twenty-two varieties of plant canes experimented with at Farrels has been forwarded to the Government Laboratory, Antigua, for

analysis. Trials with regard to the drying of papain obtained from seven different types of papaw in cultivation are being continued. The rainfall for the month, recorded at Grove Station, was 4·97 inches, making a total for the year of 13·71 inches.

ANTIGUA. In his notes for the month of April, Mr. T. Jackson, the Agricultural Superintendent, records the reaping of the sugar-cane experiment plots on four estates where the experiments are carried out. During the month 2,154 lb. of cotton seed, 1,000 onion plants, and 16 miscellaneous plants were distributed from the Botanic Station. With regard to the young cane crop, Mr. Jackson reports that, on the whole, a good stand is observed throughout the island. The planting of cotton is being begun both on estates and on small holdings. Unfortunately, however, the close season does not seem to be enforced, as there were still fairly large numbers of plants from which cotton is being picked. The quantity of cotton purchased from peasants by the Antigua Cotton Growers' Association has amounted approximately to 10,000 lb. During the month the eradication of food-plants of the cotton stainer has been pushed on, 7,318 mahoe trees and thirteen large silk-cotton trees having been destroyed. The rainfall for the month at the Botanic Station was 2·72 inches, much less than the quantity measured in other parts of the island. The rainfall to date for the year is 11·48 inches.

ST. KITTS. Comparative trial plots of St. Kitts, St. Vincent, and Montserrat cotton have been planted out in the Experiment Station. A new variety of Indian corn received from St. Croix, and white Lima beans from Grenada have also been planted. Mr. Shepherd, the Superintendent of Agriculture, notes that, besides the usual routine work in the Botanic Gardens, seedlings of the recently received *Momordica cochinchinensis* have been planted out. With regard to the cane crop, Mr. Shepherd states that the Basseterre factory is about half way in its crop. The heavy rains during the latter part of April somewhat interfered with the supply of canes, owing to the damage to roads, so that the factory had to close down for a few days. The young cane crop is looking well, although the very heavy rainfall in the northern district has done a great deal of damage to growing crops. Since the rain, cotton has been planted, but some trouble has been experienced in the germination of the seed, so much so that fresh seed obtained from Anguilla has had to be used for supplies in many cases. The rainfall for the month was 7·59 inches, making a total for the year of 11·49 inches. This was at La Guérite, whereas in the northern districts the rainfall recorded in April was 21 inches, of which 19·4 was registered in the last week of the month.

NEVIS. As in St. Kitts and in Montserrat, trial plots for comparison have been planted in Nevis of cotton seed from Montserrat, St. Vincent, and St. Kitts. During the month there were distributed from the Botanic Station 780 lb. of selected cotton seed, and 900 sweet potato cuttings. Mr. Howell, the Agricultural Instructor, states that the present sugar cane crop is almost reaped, but that the young cane crop has been much kept back by the dry weather in the early part of the year. A large acreage has been planted in cotton during the month, but, as in St. Kitts, there is a complaint of very poor germination of the seed. The destruction of the native food-plants of the cotton stainer is being proceeded with. The rainfall for the month was 2·79 inches, making a total for the year of 7·50 inches.

VIRGIN ISLANDS. Mr. Fishlock, the Curator, notes that from the Botanic Station, Tortola, there have been distributed 5,800 onion plants, 500 potato cuttings, and 250 sugar-cane plant tops. The Government cotton factory was closed for the purchase of cotton on April 26. The total crop handled by the factory is expected to be about 27,000 lb. of lint—about double that of last year. On account of a large demand for ground provisions in St. Thomas, and the high prices obtained there, considerable interest continues to be displayed in the cultivation of such provisions in Tortola. The total rainfall recorded at the Station for the month of April was 7·65 inches, being more than 5 inches above the average for the same month of the preceding eighteen years.

AGRICULTURE IN BARBADOS.

Light showers have fallen during the past fortnight, and these have been very acceptable. The atmosphere has been considerably cooled, and there has been a most welcome respite from the intolerable dust storms which raged during March and April.

While the showers have been very refreshing, they have been insufficient to produce much change in vegetation other than grass-land. A heavy rain, such as those which fell at this time last year, is necessary to revive the young canes and enable them to make a real start.

It is to be noticed this year that the trashing of the young canes on some black soil estates has been postponed to a later time than usual.

The earlier trashing of the fields would doubtless have aided, if only to a slight degree, in the retention of moisture. It may be observed, however, that some fields, particularly of B.6450, although trashed fairly early during the season, have turned very yellow. The soil in Barbados, after the cropping of decades, has no reserve, and is unable to stand a strain like that to which it has this year been subjected.

With the recent showers another start has been made with the first application of chemical manure to the ratoons.

In Christ Church and St. Philip a few crops have been finished, and others are very near their close. In St. Lucy also, several estates will soon finish grinding. The average yield in the black soil (St. Lucy excepted) where only plant canes are grown, will be about 30 tons per acre, and where ratoons formed a part of the crop, about 25 or 26 tons per acre.

The quality of cane tops collected this year, especially from plant canes, is much below the usual return. Some estates have had but little fodder remaining over to be stacked after meeting their requirements from day to day. This will mean a shortage of material for forcing manure during the latter part of the year.

Some ploughing has been done since the recent showers, and preparation for yams, on a limited scale, has been put out of hand. Some supplying of irregular fields of fall potatoes has also been done, but the planting of ground provision to any appreciable extent cannot be attempted until a heavy rain has fallen. (The Barbados *Agricultural Reporter*, May 17, 1919.)

With regard to the cultivation of the camphor tree within the limits of the British Empire, it will be noticed, if one follows the latitude of Formosa, between, 20° and 25° N. latitude, where the camphor tree is most abundant, across the map of the World, that Upper Burma and certain of the provinces of India come within the limit. Northern Egypt, especially the Delta, seems to offer suitable conditions, and so do the West Indies.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†Provided by the Imperial Department of Scientific and Industrial Research.

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial emphasizes the advisability of paying attention to results of past work so as to secure the reliability of future attainments.

Insect Notes, on page 170, contain an interesting account of the periodic migrations and depredations of the cotton worm.

On page 174, under Plant Diseases, will be found the first portion of a report on the froghopper pest and disease of sugar-cane, by the Mycologist on the staff of the Imperial Department of Agriculture.

An article on the possibilities of camphor cultivation in the West Indies appears on page 173.

Index to the 'Agricultural News'.

With this number of the *Agricultural News* is published, as a supplement, the Index to Volume XVII. This may be bound in the usual manner with numbers 410 to 435, of which Volume XVII is comprised.

The Index should prove useful for purposes of reference on all matters relating to tropical agriculture, but especially will it be of value as a guide to concise information on insect pests and fungus diseases of tropical cultivated plants.

Subscribers to the *Agricultural News* are advised to bind the volumes, because only in this way can a periodical serve for future reference—a function of importance. Although much of merely ephemeral interest is contained in the issues of this Journal, yet articles often appear of sufficient value to be kept for future reference with regard to questions affecting tropical agriculture in general, and more especially with regard to the problems that are presented under West Indian conditions.

Abnormal Rainfall in St. Kitts.

Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts, has forwarded some notes with regard to the heavy rains which fell in that island during the last week of April, and the damage caused by them.

He says that the rainfall was very heavy from Molineux estate all along the northern end of the island, 19·4 inches having been registered from the 20th to the 30th of the month. The damage both to estate roads and fields was very considerable; roads that were in good driving order no longer exist in some places, having been washed out to a great depth. On some estates the fields have been broken up, and much of the surface soil carried away. On one estate about 4 acres of cane ready to be reaped were washed away, the water making a clean breach right through a field of canes which was estimated as likely to yield about 35 tons per acre. On account of the damage done to the roads, all communication with several estates in the northern part of the island was completely interrupted for about a week. The public roads, however, were speedily repaired, and traffic has been resumed. The Basseterre factory stopped work and sent their hands out to assist in the repairs.

In contrast to the damage occasioned in the northern part of St. Kitts, the Valley district around Basseterre has been greatly benefited by the heavy rain, the young cane crop being enabled thus to make a good start.

Plants Poisonous to Stock in Antigua.

A copy of a pamphlet recently published by Mr. H. Cecil Ives, M.R.C.V.S., Government Inspector of Animals in Antigua, has been received at this Office. The author states that the pamphlet has been published with a view towards assisting owners of [illegible] with suspected cases of vegetable poisoning, seeing that in some instances neglect in observing the symptoms, or delay in seeking professional [illegible] to loss of the animals.

With this object a list of plants occurring in the island, with their botanic and local names is given, together with the toxin which is supposed in each case to be the origin of the deleterious properties, and also the symptoms which may be observed in animals after feeding on each plant. Plain directions for treatment in each case are added. This pamphlet is likely to be very useful to stock owners, not only in Antigua, but in other islands where the plants noted are generally to be found. There is one plant omitted in Mr. Goodwin's list which is certainly found in Antigua, and is well known to be a dangerous weed, that is, *Spigelia anthelmia*, locally known in the English islands as 'wormweed'. An account of this plant will be found in the *Agricultural News*, Vol. XVII, p. 411.

It must be observed that although in the case of almost all the plants mentioned by Mr. Goodwin the poisonous properties exist throughout the plant in all its parts—roots, leaves, fruit—in the case of the castor oil plant the leaves are used and valued as fodder in India, according to Watt's 'Dictionary of the Economic Products in India'. In this plant it is only the seeds that are poisonous to stock.

It may be pointed out that there seems to be a misprint in the list of plants in attributing the vernacular name of 'water hemp' to *Bidens coreopsides* instead of to *Spilanthes uliginosa*; and also it may be remarked that the Bidens referred to in the list is probably *leucanthus* and not *coreopsides*.

Deterioration in Sucrose Content of Canes.

In the *Agricultural News*, April 19, 1919, there was reproduced an article by Sir Francis Watts, K.C.M.G., which was published in the *West Indian Bulletin*, Vol. XVII, No. 3, on the diminished sucrose content of canes crushed in the Antigua and St. Kitts central sugar factories. In this article it was suggested that this deterioration might chiefly be due to the sending to the factory of canes with too large a portion of the unripe top left on them.

It has been suggested by a correspondent from St. Kitts, who acknowledges the fact of the deterioration, that this is due to the late 'supplies' which are put in under factory conditions. Under the old system of individual estates taking off each one its own crop, a certain amount of canes was kept to be reaped in November, and the 'tops' used for plants. In January another lot of canes was usually cut for 'supplies', thus giving little difference in age between the first plants and the supplies'.

Under the factory conditions the crop is now usually planted from cuttings of the whole cane, and these cuttings in dry seasons do not germinate so readily as the 'tops', and 'supplies' cannot be put in until February, after the factories have begun to work. The supplying is continued therefore until April, so that there must be a large percentage of unripe cane by the next reaping season. This suggestion is not in conflict with the idea put forth in the article referred to, namely that the deterioration in the sucrose content of the canes is due largely to the fact that the canes are reaped in an unripe condition.

Condition of Green Limes when Shipped.

With reference to an article on the wastage of green limes, published in the *Agricultural News* for May 3, 1919, Mr. J. Jones, Agricultural Superintendent, Dominica, writes to say that 'the question of whether the fruit should or should not be cured or 'quailed' in the West Indies is one which requires special local investigation. Although such curing is condemned by the United States authorities, it is possible that citrus fruit in the United States is cured to some extent on the trees during hot autumns before they are harvested. The fruit is gathered and packed in the fields, placed in railway cars in chilled air compartments, and at once sent to market. This, however, does not help the West Indian grower of citrus fruit, who has his special difficulties to face. For instance, in Dominica, preparations for shipping limes have to be made ten or twelve days before the steamer arrives. Packing is usually done two or three days before shipping, and therefore some of the fruit is bound to be somewhat cured, while the portion received in the last couple of days is packed fresh.

It is hoped that investigations into what happens with regard to the different grades of fruit when received in New York may be undertaken by the Agricultural Department, in the interests of the trade in green limes from Dominica. It is probable that definite and valuable information will be forthcoming as the result of the Department's work in connexion with the recently established Lime Experiment Station, although no such definite information has been obtained by private shippers during a long course of years.

Recent Plant Legislation in Grenada.

The Colonial Secretary of Grenada has forwarded to the Imperial Commissioner of Agriculture a copy of a Proclamation, dated April 4, 1919, forbidding the importation into Grenada of growing coco-nut plants from any place out of the colony.

On the same date also regulations were made by the Governor-in-Council, under the authority of the Plant Protection Ordinance, in respect to the importation of coco-nuts into Grenada. These are as follows:—

'(1) All coco-nuts in husk imported into the colony shall on arrival be forthwith delivered to the Superintendent of Agriculture for treatment with efficient fungicides.

'(2.) All such nuts shall be planted in nurseries apart from growing coco-nuts in such places as may be approved by the Superintendent of Agriculture.

'(3.) All such nurseries shall be visited from time to time by the Superintendent of Agriculture or any person deputed by him for the purpose and any resulting plants which are suspected of disease may, at the discretion of the Superintendent of Agriculture, be destroyed.'

The legislation which has been recently enacted in the several West Indian islands regulating the importation of plants is very necessary, in view of diseases and pests which, if introduced, might lead to much loss in established industries.

INSECT NOTES.

THE COTTON WORM.

The Agricultural and Commercial Society of Nevis, at a regular meeting held in November last, passed a resolution to the effect that the Government should request that an officer of the Imperial Department of Agriculture be sent to Nevis to investigate the life-history of the cotton worm, and to advise on some more effective method of controlling this pest.

For several years the cotton worm (*Alabama argillacea*) has appeared regularly in the cotton-growing islands, the severity of the attack varying from season to season, and in each season varying somewhat from island to island. St. Vincent is the only one of the islands in which cotton is grown on a large scale where the cotton worm has very rarely occurred in sufficient numbers to do damage to the crop, or to require applications of poison for its control. Although the insect is present in the cotton fields of the island, it is usually held in check to such an extent by the 'Jack Spaniard' (*Polistes annularis*) that it does not often increase in numbers sufficiently to be a pest.

The attacks of the cotton worm in Nevis during the cotton-growing season of 1918 were severe, and much damage is said to have been done to the crop. The Entomologist on the staff of the Imperial Department of Agriculture visited Nevis in March, and attended a meeting of the Agricultural and Commercial Society. During the discussion which followed a short address on cotton pests and the cotton industry in general, it was stated by a member of the society that the resolution passed at the November meeting arose from a desire to obtain information which might help cotton growers to take steps to deal with the cotton worm in some such manner as that proposed to be adopted in the island against the cotton stainer and the leaf-blister mite, by means of a campaign during the close season, thus preventing, as far as possible, the carrying over of the insect from one cotton season to the next, reducing the early attacks, and retarding the increase of the pest. It was thus shown that an impression existed that the cotton worm is carried over from season to season like the cotton stainer, and that some line of action might be adopted for dealing with the pest in its off season.

The explanation that the cotton worm is not known to carry over from one season to another in these islands, and that invasions from sources outside these islands are believed to account for each season's infestation satisfied the cotton growers on this point. It was then decided that every effort should be made to induce all interested to provide that a sufficient supply of insecticides should be on hand at the beginning of the cotton-growing season, and that some means should be devised to compel the application of those methods of control which have been found effective in the West Indies.

The new invasions by the cotton worm year after year is a matter of importance and interest. In former numbers of the *Agricultural News* (Vol. X, p. 378, and Vol. XI, p.266) this subject was discussed. The remarkably severe attack of the cotton worm in the cotton belt of the United States in 1911 stimulated a considerable interest in this insect and its habits. Dr. W. D. Hunter, of the United States Bureau of Entomology, read a paper on the subject at the meeting of the American Association of Economic Entomologists, held at Washington, D.C., on December 27-29, 1911 (vide *Journal of Economic Entomology*, Vol. V, p.121).

In this paper, Dr. Hunter stated that after nearly a quarter of a century, during which the cotton worm had attracted practically no attention, it suddenly appeared in extreme abundance. This attack was not foreseen in any way, and the entomologists were as much surprised as the cotton growers.

The earliest seasonal record of its appearance in that year came from points in Texas and Mexico near the border, and not far from the coast. As early as May 20, defoliation had commenced at Brownsville, and by June 10 it was complete in the majority of the fields in that vicinity. In the East the first seasonal record came from South Carolina, where the insect was discovered early in July, but at that time it was very scarce, and it was not seen in large numbers until September. About this time (September 20 to October 1) enormous flights of the insect took place, and the moths of the cotton worm were recorded in large numbers in many localities in the United States.

In Washington, D.C., large swarms of these moths appeared on September 19, and at about the same time they were observed in Clarkesville, Tennessee, and Dallas, Texas. From September 20 until early in October they were being reported in Pennsylvania, and on September 28 they were found in Massachusetts.

The following is quoted from Dr. Hunter's paper:—

'Our conclusion regarding the origin of the outbreak of 1911 is that it started from two infestations. One, apparently unimportant, in the eastern part of the cotton belt, and the other, of much greater importance, which began in Northern Mexico. The filling in of the intermediate territory in the Mississippi Valley, however, can hardly be explained satisfactorily on the assumption that these two invasions increased and eventually coalesced. In fact the general heavy infestation which became noticeable throughout the South early in September can only be explained on the assumption that an invasion of moths from across the Gulf of Mexico took place shortly before that time.'

In the discussion which followed the reading of the paper, the statement was made that the cotton moths never hibernate in the United States, and never feed upon any other food-plant than cotton. Reference was made to the conflicting views held in earlier years as to whether the cotton moth hibernated in the United States. At that time only one entomologist of repute in the United States, Prof. A. R. Grote, maintained that this did not happen, and it was held that all the observations made and information collected in more recent years confirmed his opinion in the matter. Mr. E. A. Schwartz, of the United States Bureau of Entomology, who took part in the discussion, referred to a mission on which he went in the winter of 1879-80 for the purpose of collecting cotton moths or their pupae. He travelled throughout the cotton belt, and went to the Bahama Islands, but was not able to find any trace of the cotton moth hibernating. He stated that Professor Grote's opinion was now generally accepted, that the cotton moth does not hibernate in the United States, and that invasions of this insect came from some part of tropical America, probably from Brazil. In later years Mr. Schwartz visited Cuba, Guatemala, Mexico, and Panama, and his observations in these localities with regard to the hibernating of the cotton moth served to confirm his earlier opinion.

From what has been stated above it will be seen that the cotton moth invades the cotton-growing section of the United States at different times throughout the season, but in many years these invasions are not sufficiently strong to cause extensive epidemics. In 1911 the case was different

and from early in the season swarms were arriving from outside the country, producing a most serious attack on the cotton plants. At the end of the season, in September, the moths which have been bred in the cotton fields of the Southern States migrate northward, and probably they are joined by others that have come from farther south.

In the West Indies, the infestation of cotton fields by the cotton worm each year probably arises in the same way. Moths flying from Brazil or some other section of South America arrive in these islands from time to time on their northward flight, and it is likely that moths bred in the cotton fields here also fly north from island to island, and even to the United States.

Cotton growers and Department officers in each island should be on the lookout for the arrival of these swarms, and the appearance of the caterpillars in the cotton fields, and should not only take active measures against them, but also record and report such appearances. This method of invasion would seem to provide an explanation of the occurrence of extremely severe attacks at all times in the season, when there have been no preliminary attacks from which the numbers of the cotton worms could have developed.

Reference to the records published in the *West Indian Bulletin* on the Prevalence of Some Pests and Diseases in the West Indies gives interesting information in this connexion. The accounts of the occurrence of the cotton worm in 1911 (*West Indian Bulletin*, Vol. XII, pp.414-15) show that this insect was most abundant in October, November and December, and that the attacks were particularly severe. This attack may be reasonably supposed to have originated from the same source as that which supplied the enormous flights of moths in the United States in September. The moths which reached these islands were probably stragglers from the main swarms which went farther north.

The enormous numbers of moths in the flights observed in localities far north of the cotton-growing regions attracted much attention on the part of people generally. Those who have examined the condition of the moths when captured have marvelled at the perfection of the scales and marking on their wings; the condition of the insects is almost perfect when they are taken even in the most northern States, and they occur in such numbers at times as completely to cover the surfaces on which they rest, such as brightly lighted shop windows, street lights, etc.

In the discussion which followed the consideration of the cotton worm problem at the meeting of the Nevis Agricultural and Commercial Society already referred to, one member present stated that on a recent visit to Canada he was on a train which stopped at Sudbury, an important junction. There, much interest was aroused by the enormous numbers of moths which had collected on the head-light of the engine. They were in such numbers as to obscure the powerful head-light sufficiently to make it necessary for the fireman to clear them away. These moths were at once recognized by the gentleman from Nevis as the moth of the cotton worm, with which he was quite familiar as a pest of cotton.

These northern flights were often observed in past years, say some forty or fifty years ago, but until 1911 they had not been recorded for some time. Since then they have been seen nearly every year, and as noticed above, they were seen in 1918 in Canada by a West Indian planter.

H. A. B.

INFUSORIAL EARTH AS A FERTILIZER.

In the *Agricultural News*, Vol. XV, p. 47, an article was published on the use of Barbados infusorial earth as a fertilizer. In this article there were recorded very full analyses of a number of these earths, made by Professor Harrison, and reference was made to trials undertaken in Barbados between the years 1883-86 to ascertain whether they would prove beneficial to the crops when applied freely to the land. It was stated that the main fact that Professor Harrison recollects about these trials is that 'the highly calcareous earths, from which good results were expected were more or less failures, and the argillaceous earths, characterized by their high retentive power for water, were very successful, which was quite unexpected. The former remained on the fields in hard, resistant lumps for a long period; the latter rapidly crumbled down, and formed a "mulching" to the land.' It has not been ascertained however, whether any such trials have been lately made, beyond, perhaps, the occasional use of some of these earths as applications to gardens and vegetable plots, in some instances with good results.

In the course of certain recent investigations Professor Harrison has had occasion to re-examine some of these infusorial earths contained in his collection of geological specimens, and has obtained interesting information concerning their powers of retaining water. He writes as follows:—

'In connexion with some recent work I found I had a part of the Castle Grant clay I examined in 1885. It has been kept in a partially closed box for thirty-four years. It retains 16·33 per cent of hygroscopic water. After being dried it was exposed to the air in a glass case to avoid dust, and in forty-eight hours its moisture content had risen to 14·9 per cent., whilst in eight days it rose to 15·5 per cent.

'I also examined some other samples of the Barbados oceanic clays, similarly kept for thirty years, with the following results :—

	Moisture retained in sample.	Moisture gained after drying.	
		In 48 hours.	In 8 days.
Chocolate red clay ...	13·4	12·2	12 9
Bright red clay ...	13·6	12·2	12 9
Mottled red and cream clay ...	13·8	12·1	12·7
Creamy yellow clay	13·6	12·6	13·3

'It seems to be fairly certain that the earths, probably on account of the extreme minuteness of their particles, have a marked tendency to retain water, and after drying to regain moisture from the atmosphere.

'Whilst writing this I have remembered that the late Mr. de Verteuil, of Palmiste, Naparima, Trinidad, made some very extensive trials of infusorial earths, from plantations Hermitage, Philippine, and Cedar Grove, as top dressing for sugar cane in the early nineties. I analysed samples of the earths he used, which varied in clay constituents from 20·6 per cent. to 35·9 per cent., but I have never heard the result of the trials.'

The article in the *Agricultural News* referred to above states that very satisfactory results in the increase of crops were obtained by the use of the Castle Grant earth as a top dressing on fields. It would be very interesting to learn if any planter in Barbados has since made similar trials, and with what results, and also if any record exists of the results obtained in Trinidad.

GLEANINGS.

The Jamaica *Gleaner*, April 8, 1919, states that the Elders & Ffyffes steamer which sailed two days before for England carried a record cargo of 89,500 bunches of bananas. Not only was the number of bunches the largest, but they consisted of the finest fruit ever shipped from Jamaica to the Mother Country.

The timber industry of British Honduras contributes a large portion of the exports of the colony. According to the report of the Collector of Customs for 1917, the total shipment of mahogany from British Honduras was 9,933,269 cubic feet, valued at $862,077, while the shipment of logwood amounted to 4,715 tons, valued at $122,797.

According to experiments made in Ceylon, it was found that a camphor plant twenty-eight months old, of average growth, yielded 10 or 12 lb. of prunings, and that 100 cwt. of prunings afforded on distillation 12 oz. of pure camphor. A rather larger percentage has been obtained in Florida from the leaves and twigs of trees less than twenty years old. (The *Perfumery and Essentiat Oil Record*, March 24, 1919.)

Liquid manure has special advantages for garden crops, its stimulating effects on these being generally very noticeable, because the fertilizing ingredients can be absorbed by growing plants more readily in a liquid than in a solid form. All flower plants in pots and beds, and vegetable crops of quick growing nature respond noticeably to applications of liquid manure. (The *Queensland Agricultural Journal*, February 1919.)

Of all the imported pure bred hogs in the Philippine Islands the Berkshire has proved to be the best adapted for the improvement of the native stock. Berkshire-native crosses are in some cases hard to distinguish from the pure bred stock. They are shorter, broader, and with stronger backs than the native hogs. As market hogs they are exceedingly satisfactory, and equal to the pure bred. (The *Philippine Agriculturist*, October 1918.)

Para rubber has fulfilled the expectations of its most zealous advocates in Uganda. The growth of the trees and the yield of latex have been satisfactory, and a steady and permanent growth of this industry is predicted. The good prices realized for Uganda Para rubber have been maintained, Uganda smoked sheet bringing 2*s*.7*d*. per lb. with Eastern crops at 2*s*.8*d*. (The *Chamber of Commerce Journal*, March 1919.)

In commenting on an article in *Engineering* for February 21, *Nature*, March 13, 1919, points out the advantages of concrete roads. Such roads do not disintegrate under traffic, and do not soften with rain; there is therefore neither dust nor mud. The initial cost is higher, but the maintenance cost is much lower than that of macadam. The maintenance cost of an experimental stretch of concrete on the London to Chatham road, laid down in 1915, has been nil during the four years that have elapsed.

The *Port-of-Spain Gazette*, May 11, 1919, in its horticultural and botanical notes, states that an industry is being developed satisfactorily in local hat making in Tobago, the material being obtained from palm leaves. The palm in question appears to be *Thrinax argentea*, known in Trinidad as the silver thatch or bag palm. It grows wild in Tobago, especially near the sea-coast. It may also be mentioned that this palm may be observed very commonly growing wild on the slopes of the numerous islets of the Virgin group.

It has now been demonstrated that by making ensilage it is possible on the Liguanea plain in Jamaica to secure without irrigation a constant supply of succulent forage and that the product in the form of either Guinea grass or Guinea corn silage is a first class fodder which is relished by cattle, and is also quite wholesome. If Guinea grass be cut just before the seeds begin to form, and stored as ensilage, it is preserved in its most succulent and nourishing form, and enables a larger number of cattle to be fed from a given area than if it were grazed. (The Jamaica *Gleaner*, April 16, 1919.)

According to a note in *The Times*, March 18, 1919, there seems a possibility of utilizing rat skins for fur coats. At a Conference at Newcastle to consider the extermination of rats, the Veterinary Inspector to the Newcastle Corperation stated that he had approached a furrier on the question of having an industry created to deal with rat skins, and the real difficulty seemed to be the lack of a regular supply. Such an industry would create a demand for the skins which would be an incentive for the destruction of rats. During the discussion it was stated that the yearly damage due to rats was more than £15,000,000.

An editorial note in the *Journal of the Board of Agriculture*, March 1919, on weeds, draws attention to the remarkable quantity of weed seeds present even in highly cultivated soils. The writer of the note states that he once removed by hand no fewer than 1,050 weed seedlings as a first weeding from 1 square yard of good garden soil which had been well cultivated for at least three years. This would be equal to over 5,000,000 from 1 acre. It has been estimated that about £16,500,000 per annum are lost by farmers in Great Britain in growing (and getting rid of) weeds.

The genus Citrus is remarkable for the numerous hybrids and varieties that occur in it. In the celebrated Hanbury Garden at La Mortola, near Ventimiglia, as many as forty-seven varieties are grown, of which seventeen are referred to the orange (*Citrus aurantium*), four to the pomelo (*C. decumana*), and nineteen to the lemon (*C. medica*), but these are by no means all the varieties known. One of the most curious varieties of the lemon is that called Buddha's fingers, in which the component segments of the fruit are partly separated and elongated and covered with rind. (The *Perfumery and Essential Oil Record*, March 1919.)

CAMPHOR CULTIVATION IN THE BRITISH EMPIRE.

In an article in the *Agricultural News*, December 28, 1918, attention was drawn to the decreasing supply of camphor available in the world's market, owing to the fact that Japan, which possesses practically a monopoly of the production, has been absorbing increasing quantities for employment in its growing celluloid industry. The present state of the cultivation of the camphor tree in Florida was also dealt with in an article in the issue of the same Journal for March 8, 1919. In the *Perfumery and Essential Oil Record*, March 24, 1919, the question of the necessity of investigating the possibility of increasing camphor cultivation within the British Empire, owing to the wide employment of the product in modern industries, is dealt with in a very interesting article.

This matter has long received attention, and efforts were made many years ago to introduce the camphor tree into various parts of the West Indies and other tropical colonies. In the *West Indian Bulletin*, Vol. IX, p. 275, will be found an account of the examination of wood, twigs, and leaves of camphor trees introduced into Dominica some years ago. It was found on distillation that these produced only oil, and no camphor. Later on, distillation was made of the wood, twigs, and leaves of a very old tree existing in the St. Vincent Botanic Gardens, with the same results. Recently, information has been obtained from the Assistant Director of the Royal Botanic Gardens, Kew, that the camphor trees planted in Mauritius have also only yielded oil. The question then arises whether the yield of camphor is a case of climate and surroundings, or whether it is due to a variety in the plant. This question has now been settled, because in late years other lots of seed have been obtained and grown in Jamaica, Trinidad, and other West Indian islands, and these have been found to yield camphor: in Jamaica, on the plantation of Major Malcolm, in Trinidad in the Botanical Gardens, and just lately the younger trees in the Botanic Gardens, Dominica, have been found, on analysis, as shown below, to yield camphor in ordinary quantity.

The important question is therefore now settled that there are varieties of the tree, some yielding camphor and oil, and others yielding oil only. The authorities of the Royal Botanic Gardens, Kew, are investigating the botanical aspect of the question, as it is clearly of importance that only seeds of the valuable varieties should be distributed for experiments in cultivation and production in the various experiment stations or plantations in British posessions where trials are to be made.

The fact that the leaves and twigs, as well as the wood of the camphor tree, yield camphor where the variety experimented with is the right one, has also been definitely settled. In a recent examination at the Government Laboratory of the Leeward Islands of samples of fresh leaves and twigs from trees growing in the Botanic Station, Dominica, one specimen yielded 1·6 per cent. of camphor and only 0·2 per cent. of oil, while a second specimen yielded 2·32 of camphor and 0·05 per cent of oil, and a third yielded no camphor, but 1·85 per cent. of oil. The last were leaves and twigs from a tree, the seeds of which were imported many years ago, while the first two came from trees grown from seeds of more recent importation. In Jamaica also, the distillate obtained from both green and dried leaves consisted of over 2 per cent. of crude camphor, and in Florida the distillate is said to yield in some cases 2 77 per cent.

Apart from the question of different varieties of the camphor tree, the most suitable environmental conditions for its cultivation are also of importance so as to ascertain in what localities it may be exploited commercially as a profitable industry. In this connexion local agricultural officers will be able to give valuable assistance.

The range of the tree is partly tropical and partly subtropical, from about 10° to 30° N. latitude, and there is no reason why it should not flourish under similar conditions in South latitudes between the same degrees. It is said to flourish best on hillsides and mountain valleys, where there is a moist atmosphere with good drainage, The tree is known to respond well to fertilizers, but apparently it does not flourish on calcareous soils. Siliceous soils or sandy loams suit it best, but it is probable that it would thrive equally well on volcanic soils.

The trees bear severe pruning with little apparent injury ; one-third of the leaves and young shoots may be removed at one time without materially checking the growth, so that although the woody portions, and especially the roots, contain most camphor, it will probably be better, under systematic cultivation, to distil the twigs and the leaves once or twice a year, just as is done in the West Indies with the bay tree, rather than to wait many years for the wood. It is stated that when trees are killed nearly to the ground by frosts, they send up vigorous shoots from the base. Possibly the same might be the case if the trees were cut down carefully. This suggests that it might be possible or advantageous to pollard the trees from time to time, thus making use of some portion at least of the valuable wood.

The camphor trees are usually grown from seeds, as the tree fruits abundantly, and seeds are more easily grown than cuttings. It might, however, be very advantageous to raise plants from cuttings of the best varieties, so as to ensure the purity of the strain. Seedlings may be grown in plots or in nursery beds, and when the plants are two years old, about 20 to 40 inches in height, they are then finally set out at distances of 10 feet apart, unless it is intended to plant them in hedges, as is successfully done in the Florida plantations.

Special attention is being drawn to this question of camphor production, as it appears to be an industry which might very profitably be developed in several islands of the West Indies, where climatic and soil conditions are suitable. That the trees grow well and flourish in parts of Jamaica, Trinidad, and at the Botanic Stations in Dominica, St. Lucia, and St. Vincent, is now an established fact, and, as mentioned before, where they are of the right variety, camphor is produced in what promises to be a paying quantity.

For such islands the extension of camphor cultivation, without in any way interfering with other industries, would seem to offer great advantages. Camphor hedges, as windbreaks to lime or cacao plantations, would seem to be worth experimenting with, even if extensive areas were not devoted entirely to camphor plantations, though this large cultivation appears to be well worth consideration. The apparatus necessary for distilling leaves and twigs is not very complicated or expensive. The crude camphor, when produced, offers many advantages to planters in islands where communications are difficult, and shipments uncertain. One donkey could carry over mountain roads many pounds of camphor worth a considerable sum of money, and camphor does not spoil by keeping, so that the producer has the advantage of being able to store his product for a long time without risk of loss.

The foregoing considerations lead to the conclusion that the question of the cultivation of the camphor tree deserves serious attention as an industry in these West Indian islands.

PLANT DISEASES.

INVESTIGATION OF THE FROGHOPPER PEST AND DISEASE OF SUGAR-CANE.

In December 1918, Mr. W. Nowell, Mycologist on the staff of the Imperial Department of Agriculture, visited Trinidad at the request of the Government of that colony for the purpose of making investigations on the prevalence of the froghopper pest, and its relation to disease of the sugar-cane.

When Mr. Nowell's services were asked for in this connexion, the investigations which had been in progress for some time had reached a stage when it was felt that factors other than the presence of froghoppers were at work, causing the serious loss of the sugar crop which was complained of. Mr. Nowell's investigations fully confirmed this impression. His report, which it is intended to publish in the pages of this Journal, will doubtless be of material service to those engaged in the sugar industry of Trinidad, and of interest to cane planters generally.

Mr. Nowell writes :—

'The situation which led to the request for my services I understand to have arisen as follows : Mr. C. B. Williams, Entomologist-in-Charge of Froghopper Investigations, had found that the prevalence in sugar-cane fields of the condition known in general terms as blight, in many cases did not correspond with the severity of froghopper infestation. In some cases of severe injury the insect was never present in numbers which appeared to be at all adequate to explain the damage, while in others, froghoppers were present in large numbers with much less visible effect on the cane. Mr. Williams reached the conclusion that an additional factor must be involved in the production of blight, and this he came to believe was root disease of fungoid origin. For this reason he desired the co-operation of a mycologist with experience of the effects of root disease in places where no complications with froghoppers exist.

'At the time of my arrival in Trinidad the froghopper infestation was practically over for the duration of the current crop, and I nowhere saw more than a scanty and scattered remnant. The period of my visit, which covered the last two or three weeks of the wet season and the beginning of the dry, was the most suitable for the estimation of the position held by root disease in the final condition of blighted fields, though it would have been more satisfactory if I could have approached the subject with personal experience of the immediate effects of froghopper activity.

'From an early stage in the investigation, and without prejudice to conclusions as to the ability of the froghopper to produce serious damage, it became evident that the name of the insect was in popular use to cover practically all the causes which may operate to produce an unhealthy appearance in standing canes. In many fields other adverse conditions were present to a degree which I should unhesitatingly accept as sufficient to account for depression or failure, without any need to bring in the froghopper as an agent. Such conditions do, in fact, regularly produce similar results in all the islands with which I am familiar, in the absence of the froghopper and often in the absence of notable insect injury of any kind.

'It is the first necessity of success in meeting the various aspects of blight that a closer discrimination should be applied to the estimation of the causes which in any particular case produced it. For this reason, the concentration of attention in recent years on the purely entomological aspect of th subject, while it has so far failed to bring the hoped-for relief, has delayed progress in more promising directions.

'It is the main object of the present report to contribute to the understanding of the widespread type of failure of the cane crop to which the non-commital name of blight is the best to apply. It ranges, in the examples exhibited to me, from a condition in which whole fields contain nothing but stunted and worthless stools, the cultivation of which has been abandoned, to merely unhealthy fields which will give, in various degrees, reduced re' s. There is another type in which the appearance of h maintained, but development has at some stage bee: rrested that the canes look months younger than they eally are.

'The key to the correct appreciation of root disease is the fact that both its onset and its persistence depend on a condition of weakness or debility in the cane, that is to say, the existence of root disease presupposes some unfavourable circumstances which enable it to take effect. The list of the possible predisposing causes covers all the adverse conditions to which sugar-cane is subject, and a complete discussion of the reasons for its prevalence involves a survey of the whole field of cane cultivation. I propose to deal in three sections with the general nature of root disease, the apparent reasons for its epidemic occurrences in Trinidad, and the means which may be adopted for its reduction.

THE NATURE OF ROOT DISEASE.

'The name root disease has come to have specific application in the case of sugar-cane to conditions which arise from the invasion of the roots, and in severe cases the underground portions of the stool and the young shoots by the mycelium of certain fungi which normally exist on the decaying cane material in or about the soil.

The fungi concerned in Trinidad, as in other parts of the West Indies, are mainly two, or, as it would appear to be more accurate to say, two groups, each comprising two or more closely allied species.

(*a.*) The *Marasmius group.*—This is usually represented by *Marasmius Sacchari*, but the fructifications of other species of Marasmius are sometimes seen, occurring under conditions at present indistinguishable. The fruiting bodies, which are developed only under very moist conditions, are small, papery toad-stools, usually less than ½ inch across. They quickly dry up and disappear on a sunny day, and are rarely seen unless specially sought for. The mycelium of *Marasmius Sacchari* is more or less distinguishable by the appearance it produces of the leaf-sheaths being stuck closely together as if with flour paste. There is no approach to the definite and easily recognizable form pertaining to the group next to be described.

(*b.*) *The Odontia group.*—A white mycelium, easily distinguishable from that of Marasmius by its feathery pattern of growth and the production of abundant stellate crystals of calcium oxalate, has long been known as apparently capable of producing effects similar to those of Marasmius. It has been commonly referred to as the stellate crystal fungus; and, as a mycelium of unknown affinities, was given the name *Himantia stellifera* by J. R. Johnson. Recently Dr. Burt has described the fructifications of *Odontia Sacchari* and *O. saccharicola* from Porto Rico material; two closely related fungi which produce their spores on cane trash in a close-lying, granular, buff-coloured layer, hardly distinguishable without the aid of a lens from the surface of the dry trash itself. From the constant association and the apparent organic connexion of Odontia fructifications with the typical stellate crystal mycelium, I was led by observations in Trinidad to believe that the two belonged to the same fungus, and

I find on reference to *Cane Fungi of Porto Rico*, by J. R. Johnston and J. A. Stevenson, that the same suggestion has already been made by those authors. The connexion may be regarded as highly probable.

'The Odontia type of fungus appears to be much more common in association with root disease in Trinidad than the Marasmius type. The parasitism of both requires detailed investigation. So far as our present knowledge goes, their modes of operation may be treated as the same, and their effects be referred to without discrimination as root disease. For the sake of simplicity in presentation, the mycelium of either or both will be referred to as root fungus.

'Under certain circumstances, to be detailed later, root fungus is commonly present in healthy fields, carrying on an inconspicuous existence. Under conditions favourable to vigorous growth of the cane it is practically harmless, but when the vitality of the plant is depressed, and growth is slow, the presence of the fungus becomes serious. It enters the growing tips of the young roots, distorting them, stopping their development, and causing them eventually to die. It envelops the young shoots in their various stages, hindering their development by cementing the leaf-sheaths, and in the severer cases it infests internally the buds, the young shoots, and the underground connexions of the stool, and enters to some distance the bases of the developed canes.

'The general effect produced by the disease is that of shortage of water, which is brought about by interference with absorption by the roots and conduction by the underground stem system. The leaves of affected shoots have their edges rolled inwards, when those of healthy plants are expanded; they eventually turn brown from their edges inward, and in order from below upwards, until the shoot is withered to the top. The trash, where it has not been stripped, is cemented firmly around the lower joints of the canes, and under it matted roots occur up to a foot or more from the ground, sent out in an endeavour to find the necessary water. When a clump is infested early it has a characteristic stunted appearance, and several or many of the shoots may be dead and dry. Infested stools are easily uprooted, and exhibit roots which are mostly either dead or lacking in fibrous branches.'

(*To be continued.*)

AGRICULTURAL EXAMINATIONS, 1918.

For several reasons the publication of the results of the Agricultural Examination conducted by the Imperial Department of Agriculture for the West Indies in November last has been delayed. It is now possible to give a statement of the results. Candidates entered for the examination from three islands, namely, St Vincent, St. Lucia, and Antigua. The results were as follows :—

SUCCESSFUL CANDIDATES.

Name.	Examination.	Class.
S. F. Leigertwood, St. Vincent	Intermediate	2nd
D. O. St. Prix, St. Lucia	Preliminary	2nd
R. F. Goodwin, Antigua	Intermediate	2nd
V. G. Pereira, ,,	,,	2nd
H. E. McDonald, ,,	,,	3rd
C. T. Michael ,,	,,	3rd
E. Eldridge ,,	Preliminary	3rd

Although the results are, on the whole, satisfactory, it is desirable that more students should enter for these examinations, and that those who have passed the Preliminary Examination should carry on their studies with a view to passing the Intermediate as soon as possible.

The Imperial Department is indebted to the following planters and agricultural officers for the care and trouble exercised in the conduct of these examinations: A. E. Collens, Esq., F.I.C., F.C.S., Acting Government Chemist and Superintendent of Agriculture for the Leeward Islands; T. Jackson, Esq., Agricultural Superintendent, Antigua; R. S. D. Goodwin, Esq., Collins estate, Antigua; John J. Roden, Esq., Diamond estate, Antigua; W. N. Sands, Esq., Agricultural Superintendent, St. Vincent; A. J. Brooks, Esq., Agricultural Superintendent, St. Lucia.

The examination papers were prepared as usual at th Office of the Imperial Department in Barbados, and the local reports and the corrected papers were examined by Sir Francis Watts, K.C.M.G., Imperial Commissioner of Agriculture, and Rev. C. H. Branch, B.A., Acting Scientific Assistant.

The questions set for the Preliminary paper will be found below. Those set to the candidates for the Intermediate Examination will be published in the next issue of the *Agricultural News*.

PRELIMINARY EXAMINATION.

QUESTIONS.

A.—The Soil.

1. Why is the loss of humus greater in soils under tropical conditions than in those in temperate climates? How can this loss be supplied under tropical conditions?
2. What are the uses of applying lime to soils?
3. What is meant by ventilation of soils? Why is this necessary, and how may it be secured?
4. In case of the impossibility of obtaining artificial fertilizers, how would you best supply potash, if it were required in a particular case?
5. What are the influences of bacteria on the nitrogen content of a soil?

B.—The Plant.

1. Make drawings descriptive of the structure of *one* of the following: (*a*) a sugar-cane stem, (*b*) a lime fruit, (*c*) a coco-nut, (*d*) a cacao pod.
2. Describe the habit of growth of any of the following:
   a. A pigeon pea plant.
   b. A guinea grass tuft.
   c. A mango seedling.
   d. A rose cutting.
3. Explain the meanings of any four of the following terms: carbohydrate, chlorophyl, embryo, saprophyte, stigma, exogen, vascular tissue.
4. Describe what is meant by cross pollination. What is the object of this?

C.—The Animal.

1. Explain how the age of a horse is known by examination of the teeth.
2. Describe, with drawings, the digestive organs of a cow.
3. On what grounds is the rat regarded as an objectionable animal?

MARKET REPORTS.

London.—The West India Committee Circular, April 17.

Balata—Venezuelan Block, 3*s.* 3½*d.* to 3*s.* 5*d.*; Sheet, 4*s.* to 4*s.* 2*d.*
Beeswax—No quotations.
Cacao—Trinidad, 90*s.*; Grenada, 85*s.*
Copra—£41 to £42.
Honey—Jamaica, 60*s.* to 90*s.*
Lime Juice—Raw, 2*s.* 6*d.* to 3*s.* 3*d.*; Concentrated, no quotations.
Pimento—4¼*d.* to 4½*d.*
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, March 24, 1919.

Bay Oil—Lower, at 13*s.* to 14*s.*
Lime Oil—Slow, at 4*s.* 9*d.* for West Indian distilled, and 13*s.* for hand-pressed.
Orange Oil—West Indian, 7*s.* 6*d.* per lb.

Barbados.—Messrs. T. S. Garraway & Co., May 28.

Arrowroot—$8·60 per 100 lb.
Cacao—$17·00 to $18·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—No quotations.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—Dark Crystals—No quotations.

Trinidad.—Messrs. Gordon, Grant & Co., April 2.

Cacao—Venezuelan, $17·75 to $18·30; Trinidad, $17·00 to $19·00.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 18c. per lb..
Copra—$3·50 per 100 lb.
Dhal—No quotations.
Onions—$10·00 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $4·00 per 100 lb.
Rice—Yellow, $14·00; White, $9·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., May 5.

Cacao—Caracas, 21½c. to 22c.; Grenada, 19¼c. to 19½c.; Trinidad, 20¼c. to 20½c.; Jamaica, 15¾c. to 16c.
Coco-nuts—Jamaica selects, $60·00; Trinidad $60·00 culls, $40·00 per M.
Coffee—Jamaica, 19½c. to 21½c. per lb.
Ginger—15c. to 17½c. per lb.
Goat Skins—Jamaica $1·20; Antigua and Barbados, 95c.; St. Thomas and St. Kitts, 95c.
Grape Fruit—Jamaica, $4·50 to $5·00.
Limes—Nominal $6·00 to $8·00.
Mace—38c. per lb.
Nutmegs—18½c. to 19½c.
Oranges—$3·50 to $4·00.
Pimento—8c. per lb.
Sugar—Centrifugals, 96°, 6·90c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

Publications on sale of the Imperial Department of Agriculture.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

	PAGE.
Agricultural Examinations, 1918	179
Agriculture in Barbados	187
British Guiana, Health Week in	181
Cacao Pods, Opening	191
Cotton Pests in Montserrat	182
Department News	183
Dye, An Ancient Vegetable, Rediscovered	184
Education, Agricultural, Materials for a Policy of	177
Gleanings	188
Hurricane Warnings	180
Imperial Preference	185
Infantile Mortality	182
Insect Notes:—	
Living Insects by Post	187
Insect Notes (*Cont.*):—	
Pink Boll Worm	187
The European Corn Borer	186
Manatee as a Food Animal in French West Africa	181
Market Reports	192
Nature Study	183
Notes and Comments	184
Orange Oil	184
Plant Diseases:—	
Investigation of the Froghopper Pest and Disease of Sugar-cane	190
Rainfall in Antigua	183
Sugar Production in the British Empire	189
Sweet Potatoes	185
West Indian Products	191

Materials for a Policy of Agricultural Education.

IN an article to be commended for its clear thinking, which appears under the above title in the *Agricultural Journal of India* (Vol. XVI, p. 1), Mr. H. M. Leake, Economic Botanist to the Government and Principal of the Agricultural College. Cawnpore, discusses points which are fundamental to education in general, and makes application of them to agricultural education, more particularly as concerns the conditions existing in certain parts of India.

He establishes some of these principles by making comparison between the general education of youths and the training of a University boat's crew. In the training of his crew, the coach, who is the teacher, can deal with the individual members of the crew, consulting them as to their work and exercises, and can be guided by their personal views and feelings; this is not possible in the case of a class under ordinary educational training, for the individuals of the class are unable to indicate correctly their mental needs and feelings as regards their training.

The outlook of the boat's crew, and the relationship between them and their coach, or teacher, are very different from that obtaining in the case of the ordinary educational teacher and his class. In the case of the boat's crew the object of the training is to secure a collective result in which the crew counts for everything and the individual for little. In educational training the opposite is practically the case; the success of the individual is mainly the objective. Again, in the case of the boat's crew, as already stated, the individual members have reached an age of discretion, and can discuss with the coach the effects of the training on their physical fitness. The pupils of a class are unable to do this, so that the teacher has to use his own discretion as to the work to be done and the training to be undergone—a matter which throws additional responsibility upon him.

Furthermore, in the case of the boat's crew, little regard is paid to the after effects of the training once the race is won; the opposite is the case in scholastic training; the resultant effects judged over long periods of time are the touchstone of success. It is pointed out how the judging of the race, or the examining of the pupils has a bearing on the nature of the instruction given. In the race the judge pays no regard to individuals; he is simply concerned with the collective efforts of the whole crew, an aspect which bears on the training given, which is collective rather than individual.

In the case of the scholastic examinations there may be two aspects: the examiner may so frame his questions as to ascertain the general standard of the class as a whole, or he may frame them so as to pick out the best pupils, and so have regard to individual rather than collective merit. The writer shows that the former aspect is the only suitable one when considering the general training of classes or bodies of youths: the latter is the system applicable to competitive examinations, where it is desired to select youths of unusual merit for special purposes.

As the outcome of these and similar considerations, the writer points out that it is all important that the teacher should be able to realize the mental attitude of his pupils, and to recognize that what may appear perfectly clear and logical to him may not necessarily appear so to them, owing to their less advanced training, and their limited experience. The danger is very real, the writer says, that in evolving a system which is reasoned and logical the teacher is evolving one which by the very fact that it is reasoned and logical, will appeal to the adult and not to the pupil mind. Such a teacher has, in fact, failed in one of the main functions of a teacher because he lacks the capacity of projecting himself into the position of the pupil. The conclusion is that in general educational matters it is the individual that must be considered rather than the system.

Very interesting and fundamental questions are discussed in regard to the nature of the training which ought to be offered to the youths of any country. The object of the training to be given is to render the individual a useful citizen. Here it is shown that his usefulness has two aspects: his usefulness to himself, and his usefulness to the community in which he lives; and that the former is largely conditioned by the latter. Unless an individual can be useful as a member of a community, he is unable to be useful to himself. From this it follows that the requirements of the community govern the nature of the training that must be given to its individuals.

In developing this idea, the writer says: 'education considered from a national aspect must be diverse, and, in its practical aspect, the development of the mind in a form which will leave the individual in a condition in which he will render useful service as a citizen. In former times the guiding factor in the choice of a profession was mainly parentage, the son following the trade of the father, and this is still very largely the case, especially in more backward countries. But modern thought—the result of compulsory education—is increasingly in favour of equality of chance, irrespective of birth. Within wide limits, therefore, the diversity of education should place within reach of each individual a form of education suited to his probable future life. A more detailed consideration of the true meaning of this statement is desirable, since it is here, I think, that the fallacy contained in the modern claim for equality of chance, and the various doctrines arising therefrom, is most readily exposed'.

Mr. Leake proceeds to show that equality of chance would imply a claim on the part of each individual to an education fitting him for the most lucrative professions, but it is obvious that this is a self-destructive proposition, for no community could exist whose members were all educated to what are now the lucrative professions. 'Food and the thousand necessaries of life have to be produced by human labour, and for that labour the education required for the lucrative professions is unsuited. Equality of chance is, therefore, not obtainable by the provision of an education qualifying for the most lucrative fields of employment. The alternative, the equalizing of the reward, while perhaps not theoretically unsound, is practically unattainable. Labour of the brain has always been, and will continue to be, more liberally rewarded than labour of the hands, though change may occur in the degree of divergence.' Equality of chance is thus a fallacy; nevertheless the idea has an underlying basis of truth. That truth Mr. Leake thinks is this. 'While for the majority, it is desirable that an education shall be provided that will fit them to fill the station which they are most likely to occupy in life, namely, that into which they are born, modern thought demands, and rightly demands, that the individual should not be bound by the accident of birth. Far from this meaning that each individual has a claim to the highest form of education, it implies that a ladder should exist by which individuals in any particular station can ascend, if so fitted, to a higher one. Advancement is thus not an inherent right, but the reward of merit. One error running through educational discussions and educational schemes is the misplacement of these two objects of education—the conversion of the ladder provided for the gifted to a broad staircase for the mediocre'.

These ideas are fundamental to the framing of any sound scheme of education; failure to recognize them has wrecked many benevolent plans of agricultural education; something akin to these ideas may be found in the article which appeared some time ago in the *West Indian Bulletin* (Vol. XIV, p.171), and referred, to in the pages of this Journal (Vol. XIII, p. 326), under

the title 'On Agricultural Education and its Adjustment to the Needs of the Students'.

At the present time of reconstruction, agricultural education is receiving attention in many directions in these colonies as elsewhere. This attention is being directed to elementary, secondary, and higher education. In all this it is vital that the leaders of thought should have a clear conception of the principles enunciated by Mr. Leake, and should clearly understand the limitations imposed by the conditions of social existence. Ignorance of them, or neglect to realize them, gives rise to schemes and ideas inept in their effect, and leading to discontent.

AGRICULTURAL EXAMINATIONS, 1918.

In the last issue were published the results of the recent examinations conducted by the Imperial Department, together with the questions set in the Preliminary Examination paper. The following are the Intermediate papers :—

INTERMEDIATE.

GENERAL AGRICULTURAL SCIENCE.

A.

1. Give an account of the characteristics of, the injury done by, and the methods of control for, *either* (a) the sugar-cane borer, *or* (b) the leaf-blister mite of cotton.

2. Describe the damage done, and the means of control to be adopted in the case of any fungoid or insect pest in your island of either cotton, canes, or citrus fruit.

3. How would you distinguish the larva of a large fly from that of a beetle ?

4. What is meant by *root* disease of any crop ? Describe the *root* disease of any crop which has come under your notice, and state the measures to be adopted for its control.

5. Why is rotation of crops advised ? Give your idea of a suitable rotation of crops in your island, stating periods, and giving reasons.

B.

6. Explain with drawings the process of budding. What is the practical object of budding ?

7. What is the value in the soil to plants of compounds of the following : lime, phosphate, potash ? How would you supply a soil with *one* of them—whichever you select—if lacking ?

8. Give details of the methods and cost of harvesting *either* a 10-acre field of sugar-cane, *or* a 10-acre field of cotton. (Harvesting means picking or cutting, and conveyance to the factory or ginnery.)

C.

9. What are the artificial manures best suited in your island for (a) sugar-cane, (b) cotton, (c) Indian corn ? How and when would you apply them ?

10. Why is it that the conservation of urine is to be advised on estates ? What would you do towards this ?

11. What quantity and what kind of fodder should be provided for a working ox per day or per week ?

12. Describe how pen manure may best be prepared under circumstances with which you are familiar.

INTERMEDIATE.

SPECIAL CROPS.

A.—Sugar-Cane.

1. In what way has the introduction of new seedling varieties benefited the sugar-cane cultivation in the West Indies? Describe any one variety cultivated in your island.

2. Describe the root system of the sugar-cane. How is the knowledge of this of value in practical planting ?

3. Give your idea as to what is the best system of manuring ratoons, stating your reasons.

4. Describe the implements used in your island in the cultivation of sugar-canes. Could you suggest any change of method likely to be useful; if so, what ?

5. What is the most troublesome pest or disease of sugar-cane in your island? Describe it, and say what can be done to counteract it.

6. What is done in your island with cane tops, stumps of canes, and trash? Can you suggest any improvement in their disposal?

7. How many labourers do you think would be required to keep in first rate condition 100 acres of canes, from planting to reaping? Give details to support your estimate.

8. In your island do ratoons pay? If so, for how many crops? If not, why not? Give reasons for your opinion.

B.—Cotton.

1*. Make an examination and record the results in tabular form of the specimen of cotton submitted to you.

2. What are the soil and climatic conditions specially suited to Sea Island cotton? How does your island answer to these conditions?

3. How is the land prepared for growing cotton?

4. How do you plant your cotton seed, and how much seed do you use per acre? Give reasons for your answers.

5. What are the best measures to be taken against (a) leaf-blister mite, and (b) cotton stainer ?

6. How is the cotton in your island dried, prepared for ginning, and graded?

7. What crops, and why, would you advise as rotation crops with cotton ?

8. State your opinion as to the best way of maintaining the fertility of soils under cotton as the principal crop.

*This question must be attempted.

C.—Provision Crops.

1. How are sweet potatoes usually cultivated in your island? Can you suggest any improvements, either in the method of planting, or in preparation of the land?

2. Discuss the question of growing Indian corn as a catch crop as against growing it as a chief crop. What yield would you expect per acre in each case under average conditions of soil and rainfall?

3. What are the chief difficulties against which an onion grower in your island has to contend? How are they best met?

4. What are the advantages of growing leguminous crops (a) for human food, (b) for fodder, (c) for green dressing ? What kinds do you consider most suitable for each purpose in your island ? Give your reasons.

5. Describe the method of cultivating either yams or tannias.

6. Why are ground provisions of the various kinds not grown more extensively in the West Indies? Can you suggest any means of increasing the production of these crops in your island?

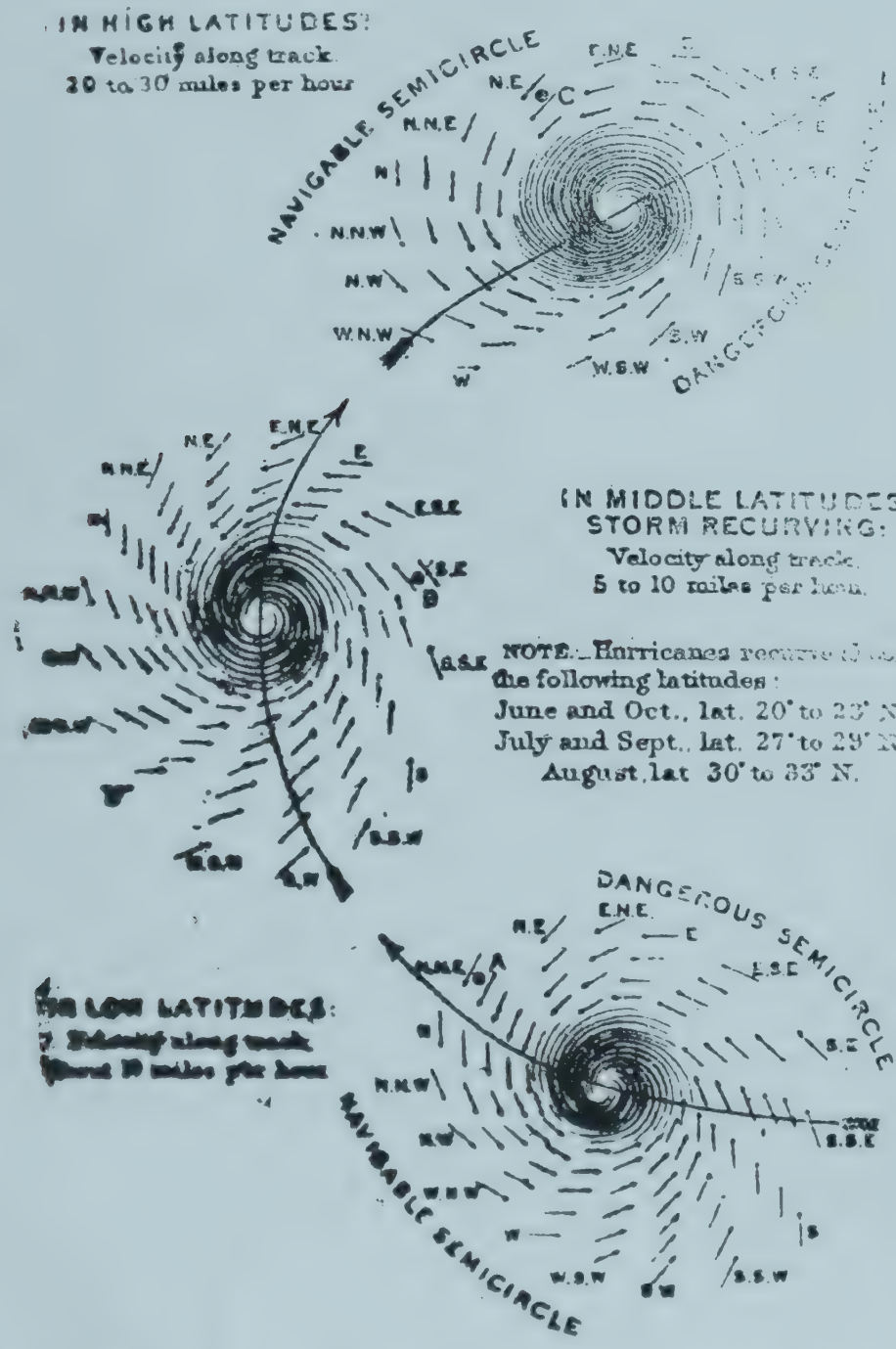
HURRICANE WARNINGS.

The approach of the hurricane season makes it desirable to republish the following information concerning their nature, and the signs which indicate the approach of these storms in the West Indies.

It is urged that instruction in connexion with this subject should be given in all secondary schools in the Windward and Leeward Islands, and possibly in the primary schools as well. One or two lessons given in each year immediately before the hurricane season should prove of real service.

It is first desirable to point out the nature of a hurricane and its path of transition. With this object the diagrams below have been reproduced, having first appeared in this Journal in connexion with an editorial on hurricanes (see *Agricultural News*, Vol. VIII, p. 209).

The lowest figure represents the storm during its passage through the West Indian islands, before it takes a sweep round to the north or West of Cuba, into the North Atlantic (top figure).



The motion of rotation, and the motion of translation may be well understood by spinning a top and giving it a counter-clock rotation. It will be seen that while the rotation may be very rapid round the centre, the top itself may remain in one spot. This rotation corresponds with the violent wind of the hurricane. By noting the direction in which any part of the edge of the spinning top is moving in relation to the centre, it will be obvious that the position of the centre is at right angles to this line of movement. Consequently in a hurricane, if the observer stands facing the wind, the centre of the storm is on his right-hand. He can trace the movement of the centre by noting the change in the direction from which the wind blows.

The reader will find it instructive to take a number of points on the lowest section of the diagram which corresponds with West Indian conditions, and note (a) the direction of this wind (the arrows fly with the wind), and (b) the relative position of the centre.

Reverting to the spinning top, while it may remain spinning on one spot, it may, on the other hand, move from this; there will then be two motions: a spin and a progressive motion; this latter is represented in the hurricane by the movement of the revolving storm from one place to another. Usually West Indian hurricanes approach the islands from the Atlantic, that is, from East or ESE, and travel towards Cuba and the American coast, where the path curves northward and finally eastward, so that the storms pass out into the north Atlantic.

This progressive motion across the West Indian islands is comparatively slow, ranging from about 7 to 14 miles an hour.

An observer, therefore, knowing the general trend of the hurricane's path may by observing the direction of the wind and its changes, form a very good idea of his position as regards the centre, and whether the centre is coming directly towards him or is passing on the north or on the south side of him.

If the direction of this wind remains fairly constant in a direction NNE, or N, or NNW, the probability is that the centre is directly aproaching. Conversely when the wind direction remains SE, SSE, and S, the centre is moving directly away.

Where the motion of the wind changes from NE to ENE, E and ESE, the centre is passing on the south side of the observer.

When the direction changes from NW to WNW, W and WSW, the centre is passing to the north of the observer

These rules apply in the West Indies only: they should be checked by making trial observations on the lowest figure in the diagram until the matter is clearly understood. From these an observer can anticipate fairly exactly what may be expected to happen, and—a matter of great importance—he is able to recognize when the centre has passed, and the storm may be expected to begin to abate.

The violence of the wind increases as one approaches the centre; at the centre itself there is an area of calm. When this centre passes over any particular place, the direction of the wind suddenly changes, and the wind after its passing begins to blow violently from exactly the opposite direction from that from which it blew before: this is a feature of considerable importance in West Indian hurricanes. The barometer falls rapidly as one gets nearer and nearer the centre, so that the barometer affords a means of marking the approach of the centre, and the probable distance that it is away, while the changes in the directions of the wind afford clear indications of the line along which the centre is travelling.

In judging the direction of the wind it is best to note the direction in which the lower clouds are moving: this is better than observing weathercocks or flags.

It is worth noting that in the West Indies—the rule does not apply elsewhere—in describing the direction of the wind, when one employs the term south, the centre has passed and conditions may be expected to improve. This may be

confirmed by noting the position of the centre in relation to such winds as SSW, or SE, or any in which the term south occurs.

On the other hand, the dangerous position is indicated by those winds which involve the use of the term north, as may be seen by noting what is implied by such winds as NNE, or N, or NE.

The first indication of an approaching storm is frequently a heavy swell, breaking in heavy surf along the shore; these waves come from the direction of the centre of the approaching storm. They may be noticed many hours, sometimes a day or two, before the storm passes

The next indication is usually some disturbance and unusual movement amongst the higher clouds, coupled with unusual light, often a coppery glare, at sunrise or sunset, particularly the latter; the wind is then unusually irregular and puffy, and the atmosphere moist and oppressive. The next indication is a fall in the barometer, and then the observer may feel certain that a cyclone is in existence.

It is worth noting that cyclones may, and do, exist, in which the wind is rotating with only moderate velocity; they present all the characters here referred to, save that not having violent winds they do not damage; it is only when the wind blows violently that a cyclone becomes a hurricane.

These facts are readily grasped and appreciated; a knowledge of them is of great service to West Indians, enabling them to take such precautions as are possible to protect themselves and their property from approaching storms, and relieving their minds of great anxiety when they are able to recognize that a threatened storm has passed.

HEALTH WEEK IN BRITISH GUIANA.

A movement towards an awakening of the public conscience to the serious wastage in human life arising from causes within human control has led in British Guiana to what is called the 'health week' campaign, which was opened on May 17, and was to last until May 24. The Demerara *Daily Argosy*, Mail Edition, May 24, 1919, gives an interesting account of the movement which has been organized by the British Guiana Health Council under the patronage of His Excellency the Officer Administering the Government. The object of the movement is to bring before the people of the Colony facts relating to public health and the diseases which prevail in the Colony, and to impress upon them the need of making every endeavour to improve the conditions under which they live.

In connexion with the campaign there was an exhibition in the Town Hall, the object being to demonstrate the great amount of injury done to the health of persons by preventable diseases, and the means employed to suppress those diseases altogether or reduce them to a negligible quantity.

The idea is to get the public interested, and so several expedients are being used to concentrate attention for the week on the question of public health, with an emphasis calculated to inspire a popular response, and to result in permanent work for the reduction of local diseases and for improvement in conditions affecting the welfare of the people of the colony.

The exhibition itself, which was to be opened daily from 8 a.m. to 6 p.m., was deserving of a great deal of attention, and the various stalls, artistically arranged, contained a large assortment of exhibits with respect to filariasis, malaria, ankylostomiasis, dysentery, etc., while there were numerous pathological specimens showing the effects of malaria, filariasis, tuberculosis, etc. on the organs of the human body, along with photographs of the bacteria concerned in the ravages of those diseases. In the exhibition there was also a large collection of attractive and artistic posters specially prepared for the occasion. The posters were, some of them, hand-painted, others were printed with striking phrases of advice in large type. The posters dealt with contagious diseases such as typhoid and malaria; general health; flies, germs and their growth both inside and outside the body; clothing; food; and infant care and management. A special stall was set apart for literature on various health subjects.

THE MANATEE AS A FOOD ANIMAL IN FRENCH WEST AFRICA.

In the *Agricultural News*, April 20, 1918, an article appeared drawing attention to the record in the *Journal of Heredity* of experiments made by Dr. Belle on rearing the American manatee in confinement in the lagoons of Florida as a valuable and economic source of butcher's meat.

Reference to the 'Cambridge Natural History', Vol. X. Mammalia, pp. 339, and 459, shows that the writer of the article in the *Journal of Heredity* made a mistake as to the scientific generic name of this animal. Instead of Trichechus it should be Manatus. Trichechus is really the scientific name of the walrus, a carnivorous marine mammal which inhabits the Arctic Ocean. The manatee (Manatus) is a herbivorous mammal living in the fresh waters along the Atlantic coast of America and Africa.

The African species or Senegal manatee (*Manatus Senegalensis*) inhabits all the estuaries and lagoons from the mouth of the Senegal up to the river Cuenze in Angola, and often goes considerable distances up the rivers. It occurs on all the coasts of Gambia, Liberia, Ivory Coast, Cameroons, in the Congo, and even in Lake Tchad. It is very little different from the American manatee (*M. latirostris*), and its habits seem to be identical, though no specimens have been reported quite as large as those in America. Its food-plants are not sufficiently accurately known, but as the water weed *Cymodocea nodosa* occurs plentifully in the lagoons and estuaries where it dwells, it is likely, seeing that the American species feeds on *C. manatorum*, that the African species finds its food on the related plant.

A note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, December 1918, draws attention to the possibility of rearing this African species also as a food animal in French West Africa, seeing that in captivity it freely eats vegetables, such as lettuce, cabbage, spinach, and even baked apples and bread.

The African manatee is said to measure from 10 to 20 feet in length, and to vary in weight from 660 to 1,650 lb. for old males. The manatees are monogamous; the period of gestation lasts eight months, and the young are born in shallow lagoons. The family consists usually of four individuals: the adult pair, one half-grown calf, and a young one which is usually born in the autumn.

The African manatee, it is said, can easily be reared by confining it to the lagoons of the coast, and is it likely that the Governments of the various West African colonies will devote some attention to this subject, as the meat is regarded as not only nutritious, but very palatable. It would be quite easy to fix on lagoons on the coast where the confinement of the animals would be possible without too great an expenditure either for starting such aqueous pens or for keeping them up.

COTTON PESTS IN MONTSERRAT.

The total quantity of cotton shipped from Montserrat in the season 1917-18 was 409,855 lb. From the Report on the Agricultural Department, Montserrat, 1917-18, it appears that the total amount of stained cotton in the crop was 27,991 lb., or 68 per cent. of the whole crop.

There are no data to show what proportion of stained cotton might be expected over the whole island, in the absence of cotton stainer attacks, and provisionally, it is estimated at 3 per cent. of the total reapings. This is due to a variety of causes, including bacterial boll disease, attacks of Nezara bugs, etc. On this basis, reckoning stained cotton at half the value of white cotton, the loss to the island from cotton stainer attacks in the past season was in the neighbourhood of £1,280; this makes no allowance for cotton bolls so severely damaged by stainers, that no cotton was reaped from them: the actual loss is, therefore, very much in excess of this figure.

In a few isolated cases the stainers appeared early, i.e. in the month of June and July, but in most districts they were not numerous until near the close of the year, so that pickings from the second crop only in most districts were affected. It is difficult to connect some of the early infested areas with the recognized host plants of the cotton stainer, viz. the silk-cotton and mahoe trees, in the absence of definite observations showing the migratory habits of the insects, and it may be that very considerable distances are traversed by the insects on vacating the host plants referred to. A very small proportion of the silk-cotton trees bore pods in 1917, and it is only when fruiting that the trees become active agents in the distribution of stainers; moreover, the number of mahoe trees in the island is quite small, and early infestation of fields has not been found to be necessarily in close proximity to infected host plants.

Now that the beneficial results obtained in the island of St. Vincent from the total destruction of the host plants of the stainer, viz silk cotton and mahoe trees, are to hand, the inference is that this island would derive similar benefit if like action were taken, and the planting community have expressed the desire that an Ordinance enforcing the destruction of the cotton stainer host plants be put into operation.*

Observations in 1918 have shown that a very much larger proportion of the silk-cotton trees have fruited this year than usual, and after the dispersal of the cotton from the pods it was the exception to find a tree that had fruited not associated with cotton stainers in the months of May and June, so that in the current season, the cotton stainer will be more prevalent than usual. At the same time observations also appear definitely to connect certain small malvaceous plants, particularly *Sida acuminata*, with the tiding over of the cotton stainer from one season to another. This plant is generally distributed, but is found chiefly in the northern and north-eastern districts of the island, and is more common on bush lands, or where new clearings have been made. In regard to the very common species of Sida known locally as 'twelve o'clock' (*Sida carpinifolia*), there is as yet very little evidence that it plays any part in carrying over the stainer from one season to another.

SLUGS (*Veronicella occidentalis*).

As reports from cultivators, particularly of provision crops in mountain lands continue to be received of the depredations of this pest, it may be of interest to record the experience of an epidemic of slugs on the cotton breeding plot in the Experiment Station in 1917. The previous crop had been sugar-canes, and on the stumps being dug out, the trash was ranged into 5-foot rows, the spaces between the rows being flat-forked, and in these spaces the cotton seeds were planted on April 6. Soon after germination it was noticed that the cotton seed leaves were being eaten; slugs were suspected, and their collection was at once undertaken between the hours of 7 and 10 p.m. by means of a lamp. On the 13th of the month 1,035 slugs were taken, and they were collected in diminishing numbers until the 19th, when only seven were obtained. The weather at this time was very dry, but 60 parts of rain falling on the 22nd, 777 slugs were taken on the same evening, and collections were again necessary each evening up to May 8, the largest number, 1,731, being counted on May 1. The area of the cotton plot was ¼-acre, and between April 13 and May 8, after which no further slugs were seen, 8,986 were collected and destroyed.

The manner in which the slugs were distributed during collection indicated that they were emerging from the cane trash as soon as darkness fell, though there was some evidence that they were also coming from the surrounding lawn as well. Whether the collection of the slugs had effectually cleaned up the epidemic or not, it is of interest to record that a neighbouring plot planted in ground nuts on May 31, to which crop the slug is known to be partial, showed no damage from slug injury.

That the slug is a potential cotton pest there can be no question though this is the first instance, as far as is known, of actual injury in the cotton belt. There are reputed instances of damage occurring near to forest lands. The slugs apparently feed on cotton very slowly, and as many as three and four have been found adhering to small plants only a few inches in height. They eat the leaves, often cut through the young stems, or gnaw away the bark at the side of the young seedling.

Poison baits are recommended for epidemics of slugs, but very little seems to be known as to reliable means of control, and in the few cases where slugs have appeared in numbers in the Station, collection of the pest seemed the only means of saving the crops.

It may be mentioned that the cotton plot in the Experiment Station in 1918 has again been planted after canes in the same manner as in 1917, and slugs have not been observed on the plot.

*Such an Ordinance has been passed since the above was written.

INFANTILE MORTALITY.

The question of labour supply is one of great importance in all the West Indian colonies from British Guiana to Jamaica, with perhaps the exception of Barbados. This question has been looked at from various standpoints. The reason why the working population of the West Indies instead of increasing should be diminishing deserves serious study. Mr. A. E. Collens, acting Government Chemist and Superintendent of Agriculture, Leeward Islands, lately delivered an address at a meeting of the Antigua Agricultural and Commercial Society, which contained matter of considerable interest with regard to this subject. Mr. Collens stated that the question of infantile mortality had been occupying considerable attention in the West Indies for very many years, and that he had gone very carefully into it, studying the statistics of Antigua for the past thirteen years, and that in this connexion six points had struck him as being of great importance :—

(1) The census of 1901 enumerated a population of 34,178, while that of 1911 enumerated a population of 31,394, representing a decrease of 2,784. The population

for 1918 had been estimated at 31,179, a decrease of 215 since 1911, or roughly of 3,000 since 1901.

(2) The birth rate, on the other hand, showed annually an excess over the death rate; for instance, in 1914 the excess of births over deaths was returned at 490, and in 1918 the excess of births over deaths was 167. The yearly average for the past five years of excess births over deaths was 229, and yet the population decreased.

(3) One reason of this decrease has been the excess of emigration from the colony over immigration, the average for the past five years being 321 more departures per annum from the island than arrivals.

(4) Another very regrettable point was the high percentage of deaths of children under one year, which in 1915 amounted to 20·4 per cent. of total births. It is somewhat satisfactory to learn that this percentage has been decreased annually to 17·9 per cent. in 1918. On examining the statistics of Antigua for each year, an interesting point becomes evident, that in certain parishes the death rate of children under one year is within reasonable limits, while in others it is abnormally high. The solution, Mr. Collens thinks, may perhaps be found in the fact that the parishes in which the infantile mortality is within reasonable limits are chiefly farming and dairy centres, and it is possible that an adequa e supply of cow's milk for the children provides the explanation.

(5) Another point to be noted is the high percentage of deaths of children under two years due to diarrhœa and enteritis. Here again, the parishes in which there is a possibility of adequate milk supply show up wonderfully well in comparison with the rest of the island.

(6) The fact that infantile mortality was excessively high in certain parishes of the island is due to causes which within reasonable limits are capable of being amended. Under general conditions the high death rate of infants in Antigua, Mr. Collens considers, may be put down to the following causes :—

(a) Congenital debility and malformation, due to the mating of the unfit.

(b) Intestinal complaints, due to malnutrition, unsuitable feeding and a lack of knowledge.

(c) Diseases of the lungs, due to overcrowding and lack of ventilation in cottages.

(d) Malaria, filariasis, etc., and occassional epidemics of such complaints as whooping cough and measles.

In connexion with this subject it is to be noted that there was opened on May 5, in the city of St. John's, Antigua, a Baby's Day Nursery, where the children of mothers at work are cared for and fed at a nominal rate. This is a step in the right direction, and is to be commended as an example to other colonies.

NATURE STUDY.

In the *Agricultural Gazette of Canada* (Vol. VI, No. 2), the following remarks on the above subject by R. P. Steeves, M.A., Director of Elementary Agricultural Education in New Brunswick, are published, and are here reproduced as being of interest:—

'The study of nature in school through the material supplied from its environment, opens an avenue in the early grades whereby pupils are by good methods put on the right track to obtain a good education. To get the best results, interest and purposeful effort are necessary. We hear a good deal, not so much as formerly, about the value of discipline of obedience, forced if need be, all of which is very good as far as it goes. The one great difficulty is that, if relied upon and carried far, it depopulates our schools before real education is imparted. Many people in mature life have been heard to say, "Had I been shown the purpose for which I was at school, I should not have left it so soon".

'Through nature study in the early grades, interest is fostered, attention riveted, the desire to know is strengthened, and willing effort grown, while all the time opportunity for discipline of the severe controlling kind is amply afforded.

'Children have through their own unaided powers some general knowledge of environment, and this knowledge, wisely used, forms a ground work on which to build. Not only is a large fund of valuable information the result, but the training and discipline from interested application is of far-reaching value in the education of the child. Then, too, is there given by such nature study instruction during the early susceptible years of child life a bent of mind appreciative of the natural conditions of the country and accustomed to utilize them for intellectual values.

'Again we must re-state that the study of language about Nature is no substitute for the real thing. It lacks the vital spark and disinclines to application, as any counterfeit might be expected to break down

'Objects can best be studied in their natural habitat. Here they have a meaning; and hence it is important that outdoor application should precede instruction in class room. Whether the subject taught be insects or birds, plants or fish, natural phenomena, minerals, or trees, the pupil for whose benefit the exercise is given must always be the active, not the passive, agent.

'As history cannot be intelligently taught without composition, literature, writing, and geography, both as aids and as by-products, so with nature study, an intimate interlocking with composition, literature, geography, spelling, writing, drawing, and arithmetic, is not only desirable but absolutely necessary'.

Rainfall in Antigua.—A copy of the rainfall returns of Antigua for 1918 has been fowarded to this Office by Mr. A. E. Collens, the Acting Government Chemist and Superintendent of Agriculture. From this it appears that the average rainfall on seventy stations for the year was 37·87 inches, ranging from 47·99 inches at Betty's Hope Garden, situated near the central valley, to 27·34 inches at Marble Hill in the dry Popeshead district of the north-west. The average rainfall for forty-five years is 44·88 inches, so that the rainfall for the year 1918 is 7·01 inches below the average. The highest rainfall recorded in the forty-five years occurred in 1889, when the average returned from fifty stations was 73·59 inches, nearly double that of 1918.

DEPARTMENT NEWS.

Sir Francis Watts, K.C.M.G., Imperial Commissioner of Agriculture for the West Indies, left Barbados on June 5 by the SS. Vasari for England, via New York, on duty.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue summarizes an article by Mr. H. M. Leake, Economic Botanist and Principal of the Agricultural College, Cawnpore, India. In this, points fundamental in education in general are discussed, and application of them to agricultural education is made.

Insect Notes, on page 186, describe the European corn borer and the damage which it is capable of effecting in cereal crops.

The Mycologist's report on the investigation of the froghopper pest and disease of sugar-cane in Trinidad, the first part of which appeared in the previous number of this Journal, is continued under Plant Diseases on page 190.

An Ancient Vegetable Dye Rediscovered.

The discovery of anniline dyes and their production on a commercial scale so cheaply as to enable the manufacturers of them to undersell dye-products of vegetable origin has, as is well known, caused the cultivation of many dye-producing plants to be practically discontinued. It is true that many ancient fabrics, dyed with lasting and beautiful vegetable colours, are still in existence, but it is often not possible to trace the plants from which the colours were derived. The aboriginal inhabitants of America were adepts in the art of dyeing, and many Mexican and Peruvian textiles are remarkable for their beautiful and permanent colours.

Nature, March 13, 1919, has an interesting note, drawing attention to an account, contributed by Mr. W. E. Safford to the *Journal of the Washington Academy of Sciences*, Vol. VIII, No. 19, of the 'xochipalli', of flower paint of the Asters, which was derived from a plant hitherto unidentified. The plant was described and figured in old writings three centuries ago, and was supposed to have been a species of Tagetes (marigold). Mr. Safford, however, has proved that the plant is really *Cosmos sulphureus*, and has verified his discovery by obtaining the rich orange red from a decoction of the flowers, which is the colour of 'xochipalli' described by Hernandez, an old Spanish writer.

In connexion with this discovery the point of interest for West Indian horticulturists is that *C. sulphureus* has of late years become a very common showy, garden plant in these West Indian islands, having been introduced, it is said, from Mexico, its native habitat, by way of Jamaica. In some of these islands the plant may almost be said to have become naturalized, multiplying very easily from self sown seeds. *C. sulphureus* in its habit of growth is very similar to *C. caudatus*—a common native species—with pink flowers, found in these islands, but the former is easily distinguishable by its brilliant orange red flowers which are produced freely.

Orange Oil.

In the *Journal of the Jamaica Agricultural Society*, April 1919, a correspondent draws attention to the fact that a larger proportion of orange oil might be obtained from the skins of the fruit by a different process from that which is at present employed. The present method of extracting oil from oranges, as practised in Jamaica, is the old one, which is known in the similar extraction of lime oil in Dominica, as écuelling. By this process only about 30 per cent. of the oil is obtained, it is stated, the rest being thrown away with the remainder of the fruit.

The following methods are suggested in order to obtain a greater percentage of the available oil, and consequently to increase the profits.

(1) The thin layer of yellow skin containing the oil may be removed from the fruit with specially constructed machines (orange peelers) worked by hand or foot power, and very reasonable in price. This skin can be automatically fed into a form of meat grinder,

from which it emerges as pulp, similar in appearance to ordinary sawdust.

(2) From the grinder the pulp is automatically passed into a fruit press, and subjected to pressure sufficient to squeeze out about 60 per cent. of the oil contained therein.

(3) The residue is then thrown into a container partly filled with water which has been boiled and allowed to cool to about 150° F. By the aid of a suitable paddle the pulp is submerged into the hot water, and the oil floating on the top is skimmed off.

The writer of the article referred to states that a similar oil can be obtained from tangerine skins by the same process, and that the tangerine oil is considered superior to orange oil in the perfumery trade.

The writer also suggests that the juice of the oranges might be canned, and find a ready market in the United States, where orange syrup is greatly in demand for 'soft drinks.'

Another suggestion is that after the skins have been removed and the oil pressed out, the remaining portion of the fruit, together with the pulp left after extraction of the oil, can be manufactured into very palatable marmalade.

Imperial Preference.

Those concerned with the agriculture of the West Indies have hailed with satisfaction the definite announcement of the Imperial Chancellor of the Exchequer on the subject of the Imperial Preference when introducing into the House of Commons the budget for the present year.

According to the Chancellor's speech this preference is secured by reducing the duties on consumable commodities produced within the British Empire at the rate of one-sixth of the present duty, the only exception being alcohol, for which preference is secured by a surtax of 2*s.* 6*d.* on foreign produced spirit. It may be remarked that all the commodities produced for export on any considerable scale in the British West Indies are benefited by this preference—not even excluding tea, which is exported on a small scale from Jamaica. Sugar is, however, the product which is likely to benefit most from this Imperial Preference, because it is the one of which British sources of supply are most limited. West Indian sugar will now be in the favourable position of possessing two markets in which favoured treatment will be applied to it—namely Canada and the United Kingdom. In fact, in the future, West Indian sugar will enjoy a greater preference in the United Kingdom than in Canada, unless the Dominion increases her present rate of preference, should she desire to continue to attract sugar from these islands.

With regard to cacao and coffee, the preference of 7*s.* per cwt. will not only encourage the shipment of larger quantities of these products from the British West Indies to the United Kingdom, but will almost certainly stimulate their cultivation in these islands.

It may be remembered that in the old days the cultivation of tobacco flourished throughout the West Indies—in fact it was the first form of cultivation undertaken for export purposes by British settlers. The preference on tobacco may well be expected not only to stimulate the demand for Jamaica cigars and cigarettes in the British market, but possibly to lead to a revival of the interest in tobacco cultivation in other of the West Indian islands.

The surtax on rum will remove the threatened competition of the increasing output of cheap Cuban spirit, which menaced the industry in the British cane-growing colonies.

Sweet Potatoes.

The importance of the sweet potato crop in the food resources of most of these islands is considerable. In very many of the Experimental Stations of the smaller West Indies a series of experiments has been carried out for many years on this crop chiefly with a view to ascertain the varieties which give the largest yield, and which are best suited to local conditions. From *Agricultural Extension Notes*, No. 2, published by the Porto Rico Agricultural Experiment Station, February 15, 1919, it appears that the question of sweet potato cultivation is also engaging the attention of the Agricultural Department in that island. It is stated that the sweet potatoes grown in Porto Rico are not usually of as good a quality as those grown in the United States. The reason given is that the potatoes do not ripen uniformly, and that when unripe they cannot be kept long enough to cure properly. The note states that a thoroughly ripe sweet potato, which has been kept in a pile covered over with straw and earth for about two months, is superior for eating to unripe freshly dug roots.

As in known in these other islands, some varieties are of very much better quality for culinary purposes than others. In Porto Rico, in the Agricultural Experiment Station, the two varieties known locally as 'Blanca' and 'Mamey' have proved superior to other varieties experimented with there. Well drained sandy soils will produce potatoes of much better quality than heavy clay lands. It is always advisable also to plough under a good crop of cowpeas or velvet beans in preparation for planting potatoes. As regards fertilizers, the advice from Porto Rico is to spread in the furrows, which should be 3 or 4 feet apart, wood-ashes and bat guano, or 200 lb. acid phosphate per acre, and also 50 to 100 lb. sulphate of potash when the price of the latter becomes lower. The fertilizer should be covered by ploughing two furrows together, and the slips planted in the ridge formed. It is advised, in order to be sure of a good supply of plants of any desired variety, to make a seed bed. For this purpose the potatoes are laid side by side close together, and covered with about ½ inch of soil. The beds should be shaded lightly, and watered every day, if necessary. When the sprouts are 5 to 6 inches long they may be broken off and planted out. The seed bed will produce several crops of sprouts.

INSECT NOTES.

THE EUROPEAN CORN BORER
(*PYRAUSTA NUBIALIS*, HUBNER).

The European corn borer is a recent introduction into the United States It appears to have entered the country through the port of Boston, for it is in the vicinity of this city that it is established. Here it has been known since July 1917, but it was introduced some four or five years before that, according to Entomologists who have investigated this insect. From what has been learned already of its habits, food-plants, and distribution, it is believed that the European corn borer is one of the most serious insect pests yet introduced into the United States.

At the annual meeting of the American Association of Economic Entomologists, held at Baltimore, Maryland, on December 26 and 27. 1918, a paper was read on the European corn borer by Mr. D. J. Caffery. This paper appeared in the *Journal of Economic Entomology* (Vol. XII, page 92), together with a report of the discussion which followed, and there are two further notes in the same number of the journal on this insect, at pages 124 and 132. The information given herewith is abstracted from the sources mentioned.

The discovery of this insect in Massachusetts in 1917, was made by Mr. S. C. Vinal, who in December of that year reported that it was distributed over an area of about 100 square miles in the vicinity of Boston. Large quantities of raw hemp are annually imported into this district, and as hemp is one of the favourite food-plants of this insect in Europe, it is suggested that this may be the medium through which the introduction was effected.

The species is recorded as being widely distributed in Central and Southern Europe, and in Northern Asia, China, and Japan. Corn, hemp, hops, and millet are the principal economic plants attacked by the pest in the Old World, and a loss of 50 per cent. of the crops frequently results from its depredations.

Prior to its discovery in July 1917, the European corn borer had never been recorded in the United States. A more complete survey of the district revealed that in November 1918 it occurred in thirty-five towns of Eastern Massachusetts near Boston, distributed over an area of some 320 square miles. Since that time it has been discovered in the vicinity of Schenectady, New York, over an area of about 400 square miles. This infestation is estimated to be of about two years' standing, and is stated to be decidedly less severe than that near Boston.

The principal food-plants of the European corn borer in Massachusetts are the varieties of corn—sweet corn, field corn, and fodder corn. It also attacks a considerable number of vegetables, garden flowering plants, and several of the larger grasses and weeds.

The moths from the over-wintered larvae emerge about the first week in June and deposit their eggs generally on the under surface of the foliage of the food-plant.

This insect passes the winter as full-grown or nearly full-grown larvae within their tunnels in the food-plant. There are two complete generations of the insect each year, and individual females in each generation deposit an average of 350 eggs. At the present time, there are practically no parasites or other natural enemies of this insect in its new localities, and consequently its rate of increase is very rapid.

The female of this species is capable of flight, and the infestation may be spread by natural means, but the transportation of infested plant material provides the principal element of this danger. Sweet corn, or roasting ears, green cornstalks as feed for cattle, dry corn stalks used as packing material, and ripe corn on the cob are all capable of transporting the insect from infested to uninfested districts.

The Federal Horticultural Board has issued a quarantine order which prohibits all interstate movements of all corn fodder, corn stalks, whether used as packing or otherwise, green sweet corn, roasting ears, corn on the cob, and corn cobs, from all towns within the area infested by the European corn borer.

'If corn were the only plant attacked by the European corn borer, the problem of restricting the spread of the insect would be comparatively simple, but several of the other host plants present openings by which the pest may be transported through the ordinary avenues of trade.

'In badly infested areas the larger larvae of the European corn borer frequently leave their original host, whether it be corn or some of the weed or grasses, and enter other plants growing in the vicinity. This change of habitat is generally due to the fact that the food supply in the original plant has been exhausted. Under these circumstances, the larvae may attack and enter almost any plant growing in the vicinity, and possessing a moderately soft and succulent stem.

'In home gardens, and in market areas it is a common practice to grow several crops together, or inter-rowed in the same area. Sweet corn is almost always included among these crops, and serves to attract the ovipositing females of the European corn borer. After the food supply in the corn plants has been exhausted, the larvae enter other plants. In this manner the larvae frequently infest celery, Swiss chard, spinach, beans, potatoes, tomatoes and some of the flowering plants, including dahlias, gladiolus and chrysanthemums.'

The discussion which followed the reading of the paper revealed that the Economic Entomologists present at the meeting viewed the situation with grave concern, and felt that the most thorough control and quarantine measures should be adopted to prevent the spread of the insect. At the time of the meeting the Massachusetts infestation was the only one known; the occurrence of the insect in New York was discovered and reported at a later date.

The prospect of this insect, which was considered the most serious pest of corn, invading the corn-growing areas in the Central and West Central States where all the staple crops—corn, wheat, oats and kafirs would be liable to attack, and where enormous tracts of land are purely agricultural, was taken as a prospect of the most serious nature.

Any measures looking toward the control of the European corn borer, and its limitation to the area now occupied, must consist of the destruction of infested plants within that area, supplemented by quarantine measures to prevent the dissemination of the species through the transportation of infested material.

This insect is a relation of the moth borer of the sugar-cane, so well known in the West Indies. They belong to the same family (Pyralidae) of the Lepidoptera,

nd have very much the same habits. For instance, when orn is attacked, the newly hatched larvae feed at first upon he epidermis of the leaves, and then enter the stalk, nd tunnel through all parts of the plant except the fibrous oots. Here we see a similiarity to the larvae of the moth orer, which, hatching from eggs on the leaf of the sugar-ane, make their way to the stalk into which they tunnel. 'he moth borer attacks Indian corn in the same way.

If this insect should be introduced into the West Indies nd become established, there would seem to be no doubt that might become a pest of great importance, and if it horoughly adapted itself to climatic and other conditions, here is every chance that it would develop into a most serious est of corn and sugar-cane In one instance in the course f observations on the European corn borer in a plot of corn -acre in extent, it was found that 100 per cent. of the ears ere attacked, and that in certain badly infested areas n average of forty-six larvae per plant was found. n infestation in West Indian crops of anything like that egree of severity would be considered nothing short of lamitous.

LIVING INSECTS BY POST.

In the *Monthly Bulletin* of the California State ommission of Horticulture for January 1919, there is an ticle entitled 'Movie Stars Travel by Mail.' This gives an ccount of an attempt to send some living grasshoppers hrough the post from Kansas to California, where they ere discovered by the postal clerks and turned over to the tate Horticultural Quarantine officials.

The sending of live injurious insects from one State to another is a violation of the law, and when this particu-r package was held up, the addressee was communicated ith and informed that, under the circumstances, the package nd its contents were liable to be destroyed.

In reply to this communication the addressee stated at 'grasshoppers are the only insects which have some tions resembling human beings, and that these were intended be used in trick photography before the motion picture mera.' The violation of the law was stated to have been nintentional, and the quarantine officials were asked to stroy the package and its contents.

This is a good illustration of the difficulty of forcing the laws for preventing the introduction of jurious insects from one locality to another.

PINK BOLL WORM.

The pink boll worm was introduced into Texas with tton seed consigned to oil mills, and on its discovery in at State the Federal and State authorities at once started a mpaign to eradicate it. The following note would indicate at this campaign has been successful:—

'No pink boll worm has been found in Texas this year 918), and the Federal Horticultural Board is joining with the ommissioner of Agriculture of Texas in a recommendation to e Governor of that State, that the growing of cotton be rmitted under certain conditions within the quarantined stricts. These restrictions will involve complete control of e seed for planting, and of the disposition of the crop pro-uced in the season of 1919.' (The *Journal of Economic Entomology*, Vol. XII, p. 131.)

H .A. B.

AGRICULTURE IN BARBADOS

The light but refreshing showers with which May opened practically ceased on the 12th of the month. The past fortnight has therefore marked the extension of a very protracted and trying drought. This is now the third month in succession during which a minimum of rain has fallen, and it will be remembered that these were preceded by three months of very moderate rainfall. Except over limited areas in some of the hilly districts, no rain in excess of an inch has fallen since November 17 last year.

The rainfall for the corresponding fortnight last year was very favourable, exceeding, as it did, 3 inches in the lowlying districts and 4 inches in the hilly parishes. The total to date for this year is practically 50 per cent. less than that for the first five months of last year.

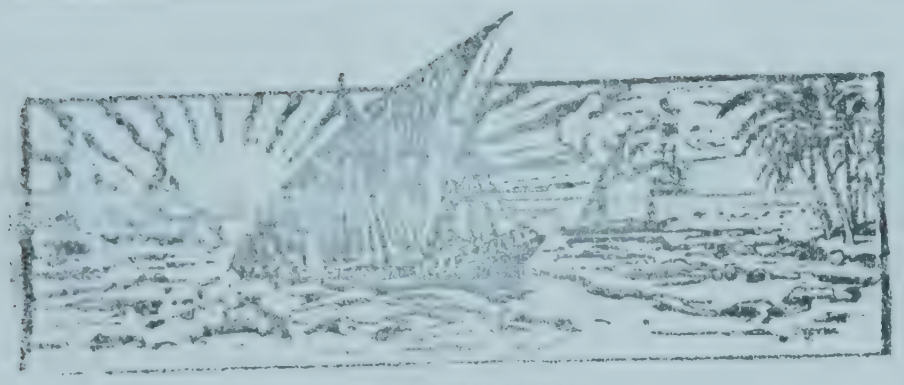
The old crop is fast disappearing. St. Lucy, with but two exceptions, has finished. The yield in this parish has been in some fields materially reduced by the ravages of the root borer, which seems to find dry weather specially suited to its destructive work.

The crops in Christ Church and St. Philip are also being rapidly closed; indeed, several estates in both parishes have already finished. In St. Michael and St. George one week more will leave few fields outstanding. The yield in these parishes, as far as we can ascertain, has been generally satisfactory in spite of the large percentage of rotten canes. The rotten canes, a large quantity of which are quite dry, are supplying the labourers with cheap fuel. They are allowed to remove them from the fields, and day by day both adults and children may be seen collecting them and taking them to their homes. With firewood at 72c. per 100 lb. our people find this privilege a real boon.

The weather this season has been distinctly unfavourable for ratoons. They need late rains to ensure satisfactory development. There is also the fact that to obtain a good return from ratoons, even with the most favourable weather, the land must receive a liberal application of farmyard manure. The new varieties should be most judiciously ratooned if their yield as ratoons is to be maintained.

In connexion with this point, we would mention that in our opinion, the Ba. 6032 should not be relied on as a ratooner. In several districts it is failing to grow regularly even under favourable circumstances. If there is undue delay in reaping the plant canes, the result will be still more unsatisfactory. We are able to speak confidently concerning the B.H.10 (12) as a ratooner. It springs thickly and vigorously at whatever stage the previous crop may have been reaped, and this is a very strong recommendation.

In referring to the young cane crop, it is fairly correct to say that two-thirds of the fields still require extensive supplying. It is intended on some estates to cut plants in considerable quantity from the last fields, and 'hatch' them for supplying the less forward fields. The more advanced fields will have to be stumped, and of this work in some fields there will be a large amount to be done. We know of one estate on which 40,000 plants will be cut for the purpose above-mentioned. It is a very long time since our planters have had such a trying season for establishing their crops. (The Barbados *Agricultural Reporter*, May 31, 1919.)



GLEANINGS.

In *Colonial Reports*—Annual, No. 980, which contains the report on the Jamaica Blue Book for 1917-18, it is stated that the banana borer is now generally recognized by planters in Jamaica, who have had experience of this insect on their plantations as not to be a serious pest, and to be controlled by measures of clean management, so as to be negligible in commercial banana cultivation.

A copy of the result of the monthly distillations of bay leaves conducted at the Experiment Station, Montserrat, during 1918, has been forwarded by the acting Government Chemist of the Leeward Islands. The yield per 100lb. of leaves in ounces of oil varied from 16·6 in February and October to 21·4 in May, and 22·4 in June, thus seeming to show that the time of year or perhaps the weather experienced exercises a considerable influence on the yield of the oil.

The production of cane sugar in Louisiana for the season beginning in the fall of 1918 was 561,800,000 lb. as compared with 487,200,000 lb. in 1917, and 607,800,000 in 1916. The cane crushed for sugar amounted to 4,170,000 tons in 1918, or an average of 135 lb. of sugar per ton of cane. The average yield of cane per acre in 1918 was 18 tons, and the estimated area harvested for sugar-making was 231,200 acres. (The *Louisiana Planter*, May 10, 1919.)

A programme of afforestation with a view to protecting and improving the watersheds of Hawaii upon which the sugar plantations are dependent for their water-supply is being organized by the Experiment Station in connexion with the Territorial Board of Forestry. It provides that the forests of the islands relating directly or indirectly to the water-supplies of the plantations shall be inspected and reported on, and the necessary steps be taken to replace the wastage of trees by fresh plantings. (The *International Sugar Journal*, April 1919.)

In a note on the preservation of farmyard manures in the *Journal of the Board of Agriculture*, January 1919, the following suggestive remarks are made: 'Farmers might feel stimulated to devote special attention to the preservation of both solid and liquid manure if they would consider for a moment what reply they would be compelled to make to the question: where do these materials come from in the first place? In answering such a question farmers will not forget that farmyard manure represents the residue after consumption or use for litter by their stock, of (1) crops grown on the farm at considerable expense, and (2) purchased feeding stuffs of very high value. It is clear that these residues are in themselves of considerable money value for manurial purposes, owing to their content of nitrogen, phosphoric acid, and potash, as well as because of the bulk of carbohydrate matter they add to the soil.'

The *West India Committee Circular*, May 16, 1919, states that information has been received that a large new central sugar factory will shortly be erected on St. Catherine Plains about 11 miles from Kingston, Jamaica. Its capacity will be 1,200 tons of cane per day, and the anticipated production will be about 20,000 tons of sugar per annum. The mills are expected to begin working for the first time on New Year's Day next year. To supply this factory with cane it is estimated that about 200,000 tons of cane will be produced on an area of 6,000 acres in the neighbourhood already under cultivation.

The area of forest reserves under the control of the Forest Department of Trinidad has been increased from 270 to 276 square miles, and now forms about 15 per cent. of the area of the colony. There are 480 acres of plantations containing 140,000 timber trees, including 62,000 West Indian Cedar and 14,000 East Indian Teak. The Teak was introduced from Burma, and continues to flourish. Trees of four and a half years old have reached a girth of from 20 to 30 inches at 5 feet from the ground, and a height of from 30 to 40 feet. (*Colonial Reports*—Annual, No. 984.)

In *Special Bulletin, No. 91* of the Michigan Agricultural College on some general information on lime and its uses and functions in soils, the conclusion is stated that there are many indications that lime is the most promising single substance that the farmer has at his disposal for soil improvement. Lime, however, should be looked upon as only one of the conditions involved in permanent systems of soil fertility. Since its presence in the soil results in a somewhat more rapid decay of vegetable matter, precautions must be taken by means of crop rotation, turning under crop residue and manures to maintain this substance which is so vital to soil productivity.

In many of the West Indian islands after a walk over grass intolerable itching is felt in the legs on account of the attack of bêtes rouges. In the *Journal of the Board of Agriculture of British Guiana*, January 1919, it is stated that a good plan when about to walk over land which is suspected of harbouring bêtes rouges is to take an ordinary piece of soap no matter how cheap, and by rubbing produce a stiff lather on the legs from above the knees down. Shoes and socks can then be put on, and no bête rouge can penetrate the soap or climb above it for at least three or four hours. In nine cases out of ten the cost of anti-bête rouge mixtures is out of all proportion to their value. The soap method is hard to beat.

The following instructions for preserving small quantities of seed, given in the *Agricultural Extension Notes* of the Porto Rico Department of Agriculture, No. 4, March 15, 1919, will probably be found useful: Take a glass jar with an air-tight cover and place some fresh calcium chloride in the bottom of the jar, place on top of the calcium chloride a piece of wire screening or even a piece of wood that is not tight-fitting, place the seed in small cotton bags, and fill up the jar. Be sure that the jar is covered air-tight. The seeds should be air-dried before being placed in the jar. If it is observed that the calcium chloride becomes very moist, it must be changed. In this way seeds can be kept fresh for a considerable length of time.

SUGAR PRODUCTION IN THE BRITISH EMPIRE.

An interesting article on the production of cane sugar in the British Empire, and the possibilities of the future with regard to this industry appeared in *The Times Trade Supplement*, May 10, 1919. Much of this article is reproduced below.

Now that Imperial preference is to become an accomplished fact with preferential duties on Empire-grown sugar imported into the United Kingdom, it will be of interest to review the position of the sugar industry in those countries of the Empire where it is carried on.

The sugar-producing countries of the Empire are India, Egypt, Australia and Fiji, Mauritius, the Union of South Africa, and the West Indies, including British Guiana. India in 1917 produced 2,626,000 tons of crude sugar, all of which was consumed in the country. In addition, 542,000 tons were imported. In the ordinary course the sugar produced in Mauritius is shipped to India, its natural market, but during the war it has been diverted to the United Kingdom, whilst Java sugar has taken its place in the Indian market.

The output of sugar in Mauritius in 1916 was 214,518 tons, which was a little less than the average of the three preceding years, and the bulk of the crop was purchased by H.M. Government at £17 per ton. The normal production may be reckoned at 250,000 tons a year. If the export of sugar from Mauritius returns in due course to its normal direction and is shipped to India, Mauritius cannot be reckoned as a source of supply for the United Kingdom. But if India largely increases her output to a figure sufficent to meet the whole of her requirements, the sugar of Mauritius would once more become available for shipment to the United Kingdom.

In Egypt sugar-cane cultivation is in a flourishing condition. In 1915 nearly 100,000 tons of sugar were manufactured from home-grown cane, and in addition, a quantity of raw sugar was imported from abroad and refined. There is also a considerable export trade in sugar from Egypt, which amounted in 1915 to 26,000 tons. The net result, however, is that the output of sugar is only slightly greater than the consumption. Though Egypt may be expected to remain self-supplying, she is not likely to produce any considerable surplus of sugar for export.

Turning to Australia we find that some 250,000 tons were produced in Queensland in 1915, and a large quantity also was imported from Fiji, Java, Peru, and elsewhere to meet the home requirements of the Commonwealth. More than half the sugar produced in Fiji is exported to New Zealand and is sufficient to supply practically the whole of the requirements of that Dominion. The remainder of Fiji's export of sugar goes to Australia and Canada. Neither Australia nor Fiji can yet be regarded as potential sources of supply of sugar for the United Kingdom.

The Union of South Africa in 1917 produced 114,500 tons of sugar. During the past ten years the sugar industry in Natal has developed apace, but notwithstanding the increase in the tonnage manufactured, the home production is not yet equal to the demand, and there is room for further extension.

In the West Indies, under the stimulus of high prices, a considerable increase in production has taken place, and it is safe to say that this increase would have been much greater had it not been for the various handicapping factors already mentioned, such as doubt as to how long the high prices will last, and shipping difficulties, as well as the absence on war service of many planters whose activities in developing the industry would no doubt have resulted in the achievement of greater progress. In Trinidad the exports of sugar rose from 50,000 tons in 1915 to over 57,000 tons in 1916; in Barbados the increase was from 30,000 tons in 1915 to over 55,000 tons in 1916. In Jamaica the revival of the sugar industry is being vigorously prosecuted, and as long as favourable conditions continue, the colony can be relied on to increase its production. The exports rose from 15,000 tons in 1915 to 28,000 tons in 1916. In Antigua exports increased from 11,000 tons in 1915 to over 18,000 tons in 1916, and in the Presidency of St. Kitts-Nevis exports were nearly 16,000 tons in 1916, as compared with 8,300 tons in 1915. In the central factories of Antigua and St. Kitts the process of converting the cane juice into sugar has been brought to a high state of efficiency. Exports of sugar from St. Lucia also have increased considerably during the war.

The effect of the war on sugar production in British Guiana has been to extend the area under sugar-cane slightly, and to increase the quantity produced about 10 per cent. The good prices obtained for sugar have made the period a prosperous one for sugar estate proprietors. The additional acreage planted with cane, however, only brings the area up to the level of ten years ago. No remarkable increase in exports has taken place, and it would appear that no great extension of sugar production can be expected until the necessary labour is provided.

Our greatest hope of any large increase of sugar production within the Empire lies in India. India produces $2\frac{1}{2}$ million tons of sugar a year, but has the lowest yield per acre of any of the great sugar-producing countries. The average yield of sugar in India is only about a ton and a quarter per acre, whereas in other countries, such as Java and Cuba, over 3 tons are obtained, whilst in Hawaii a yield of 5 tons of sugar per acre has been reached. If India's yield per acre could be doubled, and at the same time the method of sugar extraction improved so as to yield for the most part a product suitable for international trade—at present it is only of a kind for local use—India would produce enough sugar to meet the whole of her consumption and to provide a surplus almost equal to the requirements of the United Kingdom, which may be reckoned at roughly $1\frac{1}{2}$ million tons a year. The Agricultural Department of the Government of India is giving a great deal of attention to the subject, and when the vast benefit to be derived by the native cultivator and the population of India as a whole by a large increase of production is contemplated, there would seem to be ample ground for generous expenditure and extension of the efforts that are being made to attain this end. The questions which are being studied are the improvement of the canes cultivated with a view to a larger yield of sugar per acre, and the improvement of the methods of sugar extraction, which are at present careless and wasteful.

A note in *Revista de Agricultura de Porto Rico*, February 1919, states that in the experiments which Dr. F. S. Earle of the Department of Agriculture of the United States has undertaken on the south coast of the island with the co-operation of the Guanica Central Factory, only one variety of sugar-cane out of some hundred varieties planted has shown no symptoms of the disease known as mottling or yellow stripe, which has caused such anxiety to cane planters in Porto Rico. This immune variety is a Japanese sugar-cane named Kavangerie. Twelve plantings of this variety have recently been planted in plots on the Insular Experiment Station, and up to now they have been found completely resistant to the disease.

PLANT DISEASES.

INVESTIGATION OF THE FROGHOPPER PEST AND DISEASE OF SUGAR-CANE

(Continued.)

THE FACTORS INFLUENCING ROOT DISEASE.

'In soil which is in good tilth and well-drained, so that roots develop freely and penetrate deeply, root fungus may be present in abundance about the stools of plants or ratoons, and, provided the rainfall is not markedly deficient, do no visible harm. This in fact appears to be the regular state of affairs on much of the cane cultivation of Trinidad, where, at least in the Naparimas, it seems to be quite a general custom to plant between the old rows and, much later on, to divide the bank and turn the stools, full of root fungus, over on to the rows of young plants.

'That this system can in so many cases be practised with impunity is the most convincing testimony that could be adduced as to the suitability of natural conditions in Trinidad for cane cultivation. Its practice involves the assumption that no unfavourable circumstance will occur to give the fungus an opportunity of becoming harmful. The position of the cane plant under these circumstances is that of a man in an unsanitary town depending upon the maintenance of his vigour to keep him free from infection.

'Where this system of planting is associated with continuous cropping, long ratooning, and the practice of replanting during crop, so that no break of annual production occurs, we have the most extreme form of sugar-cane agriculture obtaining in these islands; one in which root disease, as a factor, is practically left out of consideration. Where it can be carried on with success, as it seems to be on the best parts of several estates I visited, I do not see that any theoretical considerations need be allowed to interfere with its continuation.

'From this extreme there is, in the West Indies generally, a long series of graduations in agricultural practice corresponding to various degrees of disability of soil or climate, until the opposite extreme is reached, as in the more arid districts of Barbados, in which plant canes only can be grown, and these have to be alternated every third, or even in some cases every second, period with a different crop, in addition to the land being thoroughly prepared well ahead of each planting season.

The governing factor in all these variations, according to my view of the matter, is the increasing necessity, as conditions grow less favourable, of reducing by preparation and rotation the amount of root fungus to which the plants are exposed, and also reducing, by curtailing ratoons, the period of exposure to the fungus which accumulates on the stools.

Discussion of the most general of the unfavourable conditions referred to can be grouped under considerations of soil and climate.

SOIL CONDITIONS.

'The physical condition of the soil mainly has effect, as previously mentioned, in its influence on free and deep rooting. On many of the blighted areas, or areas subject to blight, which I visited in Trinidad, there was a conspicuous deficiency in tilth, and this, in my opinion, is mainly due to an insufficiency of organic matter in the soil. Sugar-cane is not an exhausting crop. It supplies in trash, and in its contribution of fodder to the formation of pen manure, a liberal amount of bulky material to be restored to the soil, and the mineral constituents of the cane are mostly available for return in the ash. It is when the land is fairly treated in these respects, provided that root disease can be safely ignored, that continuous cane cultivation is possible without exhausting the soil. The soil may in the hands of a capable manager even continuously improve.

'There is a great deal of cane land in Trinidad that does not appear to have had, in this sense, fair treatment. In these cases either no pen manure or a very inadequate amount has been supplied, and frequently sulphate of ammonia has been used as a supposedly efficient substitute. While this chemical has not the notorious effect of nitrate of soda indirectly destroying, tilth, a similar result is reached if its use leads to the omission of the organic matter on which the maintenance of tilth largely depends. It has moreover a deleterious action of its own, which is set out in A. D. Hall's statement, that on soils initially poor in calcium carbonate, the removal of this substance by sulphate of ammonia soon induces a condition of actual sterility. Attempts are made in Trinidad to correct, by the application of lime, the condition of acidity thus produced, but this treatment, to be certainly effective, should be carried out under scientific control on the lines of recent work on this subject.

'The idea that the soil is a chemical mixture which can be sufficiently adjusted by adding more chemicals is now completely discredited. An agricultural soil in good condition is a culture of living organisms, mostly bacteria, on the action of which the maintenance of its fertility depends. For this bacterial flora to thrive there are in addition to moisture, two requirements: (1) organic matter, which is supplied by mulch, green dressing, and pen manure; and (2) air, which gains access through cultivation. How far some Trinidad fields are from this condition is illustrated by cases I saw in which biological activity was so reduced that buried trash and pen manure remained for a lengthy period about as little changed as if soldered in a tin. And yet when a field in this condition goes down, there is a tendency to attribute the result entirely to froghopper.

'On the close-lying, stoneless silt soils of the plain between the Northern and Central Ranges, the question of æration appeared to me to be of particular importance. A. Howard has recently demonstrated the very great significance of æration on soils of similar origin in India. The feasibility of special measures for improvement in this direction, as to which a suggestion will be made later, is a matter for experiment to decide.

'Closely related to æration is the question of drainage, the importance of which seems to be generally appreciated, though local difficulties in application have not always been overcome. It may be pointed out that poor drainage is well known as a predisposing cause of damage by root disease, operating like the conditions already described by preventing the development of a deep and copious root system.

'A factor to which my attention was drawn, as contributing seriously in some cases to loss of tilth, is the working of implements in wet weather. It is important that this should be borne in mind in relation to the present movement towards increasing implemental cultivation. I am convinced that a good deal of harm may be done by forcing development in this direction before due caution has been learned. Some cases of the occurrence of blight on estates which, in general, are excellently managed, were claimed to be due to injury brought about in this way.

'It is probable that the opposite danger should also be taken into account, though I did not actually see any instance of it: namely, the damage to tilth that results from the reduction of the soil to a dusty consistency by over-cultivation in very dry weather.

CLIMATIC CONDITIONS.

'One marked advantage which the cane-growing districts of Trinidad possess over those of the Northern Islands lies in the humidity of the air In the other islands lands which are subject to conditions as favourable in this respect were put under orchard crops when the sugar market was depressed, leaving, with unimportant exceptions, only the drier places, or those with light soils, to sugar-cane.

'In those islands, of which Barbados may be quoted as an example, the tendency to root disease is largely increased by shortage of moisture Hence arises the necessity for short ratooning periods or none at all, for rotation, for thorough and clean cultivation, for the conservation of vegetable mulch, and for the use of large quantities of pen manure. These measures have not been so necessary in Trinidad, with a climate more favourable to vegetative vigour, consequently, (since in no industry, least of all that of agriculture, are methods much better than circumstances enforce,) they have not been practised. Favourability of climate, however, can be offset by deficiencies in soil conditions just as its defect can to a considerable extent be compensated for by improvements in the same. The deterioration which has become evident in Trinidad, be its causes what they may, and which finds its expression in the increased prevalence of blight, has now rendered necessary the resort in some degree to similar measures.'

OPENING CACAO PODS.

In the article entitled 'Science in Cacao Production', which appeared in the *Agricultural News*, No. 444, reference is made to the need of inventing a knife to cut open cacao pods after they have been picked, in order to allow of the beans being extracted by the women labourers. It is pointed out that at present the cutting open of the pods is usually done by men with cutlasses, and that there is danger of injuring the beans by this method, as without correct judgment a cutlass may enter the cavity, and cut through the beans.

In order to prevent this injury, the suggestion is made that a form of knife is required which can be depended upon to cut the husk of the pod without injuring the beans within. This should be possible by fixing a guard on the knife or cutlass.

The following comment on the practice referred to is made by a correspondent:—

'This matter of employing men with cutlasses to cut open cacao pods appears to be chiefly practised in Trinidad. In other islands in the West Indies this task is usually done by women labourers. When six or eight women are engaged upon this work, a couple of them will be detached for breaking the pods open. This is accomplished by taking a pod in the hand, and giving it a sharp blow upon a small stone. By this means the pod is easily cracked, and it is then passed on to other women for extracting the beans. The work is easily and quickly done, and there is no fear of causing injury to the beans.

'The reason for the employment in Trinidad of men with cutlasses to cut open pods, with possible injury to the beans, and at a higher rate of wages than women get, is not clear to planters in other islands, though, no doubt, there are sound reasons for the local procedure. Generally speaking, it would appear that planters who employ women get the work done cheaper, better, and quicker than those who employ men; and in this case there is no injury to the beans; there appears to be no need to invent a knife for the special purpose of cutting [illegible]

It still seems a matter deserving further enquiry as to whether a better method of opening the cacao pods cannot be devised than the rather primitive one of splitting them on a stone.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of April 1919 :—

The month of April, in Mincing Lane, opened with a slight improvement in the bulk of material dealt with, but with few alterations in prices realized. Buyers continue to be content with sufficient material to meet their immediate requirements, a position increased by the general decline of many well-known products, and the anticipation of further reductions in the near future. On the other hand, in some instances the changes have been on an ascending scale. The following are some of the principal items :—

GINGER.

This article was in greater demand than it has been of late. At auction on the 16th of the month the quotations were as follows: Cochin and Calicut 50*s.* to 70*s.* per cwt., Sierra Leone and Japanese each 40*s.* to 45*s.* At the end of the month the quotations were as follows : wormy washed Cochin 62*s.* 6*d.* to 65*s.*, Calicut 65*s.*, African 52*s.* 6*d.*, Japanese 40*s.*, and Jamaica 115*s.* to 120*s.*

PIMENTO, SARSAPARILLA, CITRIC ACID, ARROWROOT, KOLA, LIME OIL, LIME JUICE, ANNATTO, AND TAMARINDS.

Pimento has been steady throughout the month at from 4*d.* to 5*d.* per lb. Sarsaparilla was in good supply at auction on the 10th of the month, when the offerings were as follows : Jamaica, 110 packages, of which 53 were sold at from 2*s.* 4*d.* to 3*s.* per lb.; Lima was represented by 35 packages, but none sold; 10 packages of Mexican were also offered but found no buyers. At the beginning of the month citric acid was easier than it had been, 4*s.* 4½*d.* per lb. being the price quoted and maintained at the end of the month, when it was stated that the price was kept up owing to the large and continuous demand for export. At the beginning of the month St. Vincent arrowroot of M. grade had been fixed at 7*d.* Kola was fully represented at auction on the 10th of the month by 26 packages, only 3 of which found buyers at from 6*d.* to 6½*d.* per lb. for 1 barrel and 2 bags of Grenada. At auction on the 10th lime oil was represented by 5 packages, all of which were disposed of, fair West Indian distilled fetching 4*s.* 10½*d.* per lb. A week later it had dropped to 4*s.* 6*d.* to 4*s.* 9*d.* Lime juice has been obtainable throughout the month at 2*s.* 9*d.* per gallon, with plentiful supplies. At auction on the 10th of the month as many as 254 packages of Annatto seeds were offered, but none were sold. Fair West Indian tamarinds have been offered at 70*s.* per cwt. on the spot.

MARKET REPORTS.

London.—The West India Committee Circular, May 29.

Balata—Venezuelan Block, no quotations ; Sheet, no quotations.
Beeswax—No quotations.
Cacao—Trinidad, 119/6 to 121/-; Grenada, 118/- to 120/6.
Copra—No quotations.
Honey—Jamaica, 75*s.* to 90*s.*
Lime Juice—Raw, No quotations; Concentrated, no quotations.
Pimento—5¼*d.*
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, March 24, 1919.

Bay Oil—Lower, at 13*s.* to 14*s.*
Lime Oil—Slow, at 4*s.* 9*d.* for West Indian distilled, and 13*s.* for hand-pressed.
Orange Oil—West Indian, 7*s.* 6*d.* per lb.

Barbados.—Messrs. T. S. Garraway & Co., June 10.

Arrowroot—$8·60 per 100 lb.
Cacao—$19·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—$4·50 per 100 lb.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—White Crystals—$7·75.

Trinidad.—Messrs. Gordon, Grant & Co., June 4.

Cacao—Venezuelan, $26·50 ; Trinidad, $25·00.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 20c. per lb..
Copra—$9·00 per 100 lb.
Dhal—$10·50.
Onions—$9·00 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $5·00 per 100 lb.
Rice—Yellow, $12·00; to $13·00 White, $9·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., May 27.

Cacao—Caracas, 25½c.; Grenada, 23c. to 23½c.; Trinidad, 24½c. to 25c. ; Jamaica, 18c.
Coco-nuts—Jamaica selects, $58·00; Trinidad $58·00 culls, $40·00 per M.
Coffee—Jamaica, 20c. to 23c. per lb.
Ginger—15¾c. to 17½c. per lb.
Goat Skins—Jamaica $1·23; Antigua and Barbados, $1·00 St. Thomas and St. Kitts, $1·05.
Grape Fruit—Jamaica, $5·00. to $6·50
Limes—Nominal $8·00 to $10·00.
Mace—39c. to 40c. per lb.
Nutmegs—18c. to 18½c.
Oranges—$4·50 to $6·50.
Pimento—9½c. per lb.
Sugar—Centrifugals, 96°, 6·90c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

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CONTENTS.

	PAGE.
Agriculture in Barbados	197
Banana Stalks, Utilization of	201
Camphor Trees in the West Indies	196
Citrus Canker, Susceptibility of a Non-Rutaceous Plant to	200
Cotton :—	
Official Cotton Standards of the United States	198
Sea Island Cotton Market	198
Department News ...	195
Deparmental Reports ...	198
Gleanings	204
Insect Notes :—	
Batocera Rubus	202
Protection of Stored Grain from Insect Attacks	202
Items of Local Interest	196
Market Reports	208
Megass for Paper-Making	205
Notes and Comments ...	200
Oil and Agriculture in the West Indies	193
Papaws	205
Plant Diseases:—	
Investigation of the Froghopper Pest and Disease of Sugar-cane	206
Plant Quarantine, Some Difficulty in Enforcing	200
Poultry Manure	200
Quarantine on Plants in the United States, New	195
Rosella Fibre	201
Soy Beans	201
Sponges, Cultivation of ...	194
Sugar Industry :—	
Cane Planting on the Flat in St. Croix ...	203
Immune Variety of Sugar-cane for Porto Rico	203
Velvet Beans for Stock Food	207

Oil and Agriculture in the West Indies.

HITHERTO West Indian industries have been almost entirely agricultural. All classes in nearly every island have been dependent upon planting in some form or other. The position is now altered. To-day we have to recognize a developing mineral oil industry.

It is true that in the case of Trinidad the production of oil is not a new development. It was in full swing as early as 1911. But it is only within the last year that a greatly increased production has taken place there. This has been due to an increase in the depth of bore of already established wells, and to the operation of new companies.

Comparatively near to Trinidad, there have been remarkable oil developments, just recently, in Venezuela. This has been encouraging, especially to underwriters and company promoters. It means that this part of the world, including the West Indies, is being boomed as a safe and profitable oil field for the investment of capital.

At no distant date boring will be commenced in Barbados. A company has already obtained certain concessions. In the other islands there are rumours and suggestions of oil production being possible, and taking everything into consideration, one is bound to recognize the dawn of a new and profitable day in the history of West Indian industrial development.

Before proceeding to consider what effects oil production has upon agriculture, it may be of interest if we say something of the origin and location of oil. These remarks must be brief and of a general character, as the subject is one that requires special knowledge and experience for an adequate treatment. Concerning the origin of oil, it is generally recognized that petroleum is derived from marine animal remains and fossil sea-weeds. It is probably a sort of distillate resulting from the combined effect of steam and enormous pressure. This production of oil may be going on to-day in Nature's laboratories far down in the earth. If that be the case, the depletion of oil fields is a less serious matter than the depletion of coal fields. At any rate there is no question that we have in the past under-estimated the stores of oil that are available. In this Journal some few years ago attention was frequently called to the possibility of alcohol being required to meet the shortage of petrol at no distant date. To-day there are very few indications of a shortage of oil fuels of mineral origin.

The strata of sedimentary rock formations generally run in waves. The crest of the rock wave is the top of an 'anticline'. It is along this anticline that oil wells are generally sunk. Hence land situated along the anticlines generally possesses a higher value from the point of view of oil production than does land situated on either side. From this it can be seen that a barren tract of land, if it forms the 'saddle' of an anticline, may be of greater value than very fertile land in a less favourable geological position.

The principal consideration in regard to the effects of oil production on agriculture is the question of surface damage. If the operating company buys the land it intends to bore, the question of surface damage affects the company only. But if the land is leased on a subsoil basis, then the company has to pay to the owners surface damages as well as royalties. The surface damage will vary according to the nature of the wells produced and the value of the standing crops. If a well turns out to be a 'gusher' there may be some preliminary leakage and consequent damage to crops. But the most likely source of surface damage is in connexion with pipe lines. These pipe lines have frequently to be carried over considerable distances, and being laid under ground, there is a certain amount of surface damage inflicted all along the line. Not unfrequently. leakages occur. The escaping oil has a very deleterious effect upon the soil, and has been known to have a serious effect upon such crops as cacao that may be growing up above. However, provision is, or should be made to ensure adequate compensation.

The local production of oil in the West Indian islands must have a considerable influence upon power production. It cheapens traction power for instance. We may expect to see mule and cattle haulage replaced considerably by motor traction. Even on the fields, it will tend to popularize motor tractors which have done very successful work in parts of Great Britain during the last few years.

In the sugar factories petroleum will probably replace megass for fuel purposes. It has been suggested that this megass can be more profitably employed for paper manufacture. Dr. Baunard, writing in a sugar journal recently, says that it is not difficult to construct a combined sugar and paper mill. At any rate a paper mill in the neighbourhood of several large sugar factories seems a reasonable and practical proposition, if plenty of cheap petroleum is available for fuel purposes.

Great as the economic value of oil production is to any community, we must not lose sight of the fact that agriculture in these islands will always be the staple industry of the people. It is only the favoured few who benefit directly from oil production. Oil is not a commodity for constructive industries as iron, wood and cotton are. Its production and transportation once started, are conducted with the smallest possible employment of labour. Agricultural industries provide, and will continue to provide a great deal more permanent employment than oil production. Therefore it is important to realize that efforts to improve agriculture must not be relaxed because of a new and quickly developing source of wealth. If anything, public expenditure on agricultural improvements like road making should be increased. This increase should be met by Government royalties on local oil. In doing this we can put back into the surface of the colony part of its natural wealth which has been obtained from below.

THE CULTIVATION OF SPONGES.

While in England recently, the Scientific Assistant on the staff of the Imperial Department of Agriculture for the West Indies made various enquiries in both scientific and commercial quarters with a view to obtaining information and arousing interest in the subject of the cultivation of sponges. On the basis of this enquiry a letter was written to and was published in *Nature* of May 8, 1919, which indicated the present position of the subject in regard to the West Indies.

In this letter reference was made to the article by the same author on sponge culture which was published in the *West Indian Bulletin* towards the end of 1915, and summarized in *Nature* of April 20, 1916. This article included an account of the American work on sponge culture in Florida and of the more recent commercial undertaking at the Turks Islands, in which marketable sponges had been reared from cuttings on cement discs in comparatively shallow sea-water. Mention was made in the letter to the efforts of the Imperial Department of Agriculture to start experiments at islands like Antigua and Barbados where, even though the locally occurring sponges are of inferior quality, suitable conditions might be found for growing introduced types of better quality by the culture method.

In the letter referred to the writer next pointed out that the uncertainty of our knowledge concerning the behaviour of sponges amid different environments, and the paucity of our knowledge of West Indian sponges and their distribution, made a proper scientific enquiry into sponge culture very desirable. Moreover, the prevailing scepticism in certain quarters regarding the profitable character of sponge culture called for a technical report on the economic side.

Opportunity was taken of bringing the matter before Dr. Harmer at the British Museum (Natural History) and Professor Dendy at Kings College. These authorities, the letter points out, consider the subject as one of great scientific interest and well worthy of enquiry even from the purely scientific aspect alone. It is clear that the study of sponges along the West Indian chain and including environmental experiments with different types would be very valuable.

This question of sponge culture in its economic aspect has been receiving a good deal of attention in the Bahamas, between which Colony and the Colonial Office a considerable amount of correspondence has taken place. The general

ute me of all efforts has been a decision on the part of he Offic al Committee to allocate from the Colonial Devel- opment Fund a grant of £1,500 for next financ al year, which amount may be continued and perhaps increased in ubsequent years, to pay for a scientific enquiry into the uestion of West Indian sponge culture. It is understood hat a marine zoologist will be sent at an early date to the Bahamas in order to start making observations. It is nderstood further that this officer will later on conduct an nvestigation in the West Indian islands farther south.

In continuing the letter to *Nature* it was pointed out hat during the war, owing to the naval occupation of the Mediterranean, Great Britain was largely dependent upon he West Indies for its supply of sponges which are essential o a large number of important industries. This in- reased trade, chiefly secured by the Bahamas, can only be naintained if West Indian production is kept up and West ndian grades of sponges improved so that they can compete vith the Mediterranean sponges which are amongst the best in he world. This may or may not be achieved by means of ponge culture, but the investigation in the Bahamas will ery soon decide the question. The writer of the etter while in London visited several sponge importers in he city, and had the advantage of being shown various rades obta ned from different parts of the world One oint was clearly emphasized by the merchants namely, that very sponge no matter how poor its quality has some industrial se and therefore some value on the market. Hence if we an produce a large number of somewhat inferior sponges heaply enough around the West Indian islands, it may pay s well as a smaller quantity of more expensive and delicate ponges which require very special conditions, and a long eriod in which to mature.

From enquiries made, the London sponge market has ad no experience in handling artificially grown sponges, but nquiries are being made of certain New York houses to which is believed the Florida and Caicos cultivated sponges are nt.

In conclusion a note may be added here on the remarks ade in the letter to *Nature* concerning American interest n the subject of sponge culture. Reference has already een made to American progress in Florida, but a more ignificant fact cannot be found than a statement in a recent British Colonial Report on the Turks and Caicos Islands, to he effect that at one of these islands 8,000 acres of sea for ponge culture has been conceded to a capitalist from New ork. While we should prefer to see British enterprise of this ature, particularly in a British colony, we nevertheless ave to recognize a high degree of consistency in United tates action. Most of the marine investigation in the Vest Atlantic has been American ; as for example, Pro- essor Nuttings' recent expedition to Barbados and Antigua nd his former West Indian expedition ; there has also been he study on the fishes of Porto Rico by the United tates Government many years ago, and quite recently he oceanographic work by the steamer *Bache*. It may be entioned incidentally, that the results of this latter work ay be found very valuable as showing the difference in onditions between the various marine environments in hese waters.

It now remains to await the investigation of sponge ulture in the West Indies which should be started owards the end of the present year. Those interested n the marine development of the West Indies, a subject which offers many possibilities apart from sponge ulture, will await the results of the coming enquiry with nterest.

NEW QUARANTINE ON PLANTS IN THE UNITED STATES.

According to the *Hawaiian Forester and Agriculturist*, March 1919, a new regulation of the Federal Horticultural Board governing the importation into the United States of plants and plant products was to become effective on June 1 in Hawaii as well as in the United States themselves. The Quarantine Order No. 37 has been promulgated by the Secretary of Agriculture to check as far as possible the introduction of any more dangerous crop enemies. It has been estimated that the losses in crops caused by pests already introduced, it is supposed for the most part through the agency of imported plants, amount to half a billion dollars annually.

Important provisions of the new quarantine are as follows : Permits are required, and regulations must be complied with, for importation of bulbs such as lilies and hyacinths ; for importation of stocks, cuttings, scions, and buds of fruit trees and rose plants ; for the importation of nuts, including palm seeds, for planting, and of seeds of most other trees, as well as of ornamental shrubs and hardy perennial plants.

Importations of leaves, except in special cases, and of fruits, vegetables, cereals, and other plant products imported for medicinal, food or manufacturing purposes, together with field, vegetable, and flower seeds are unrestricted.

All other classes of plants for propagation, including fruit trees, ornamental trees grape vines, and ornamental shrubs of all kinds, are excluded

Excluded plants may be imported through the agency of the Department of Agriculture in limited quantities, such entry being safeguarded by the highly developed inspection and quarantine service of the Department.

The Governing principles in this quarantine is to limit plant introduction to the classes of plants which have been considered essential to plant production. To these are added certain classes of plants which can be safeguarded and disinfected.

The plants permitted entry represent a considerable proportion of foreign plants and seeds hitherto imported, but exclude classes of plants including all plants with earth which are open to special danger with respect to the introduction of new pests.

Disinfection by any known means is not possible in the case of most of the ornamental plants excluded, particularly those which come with soil about the roots. No disinfection of soil is possible without destroying the plants, and many insects are not disclosed by inspection. The number of foreign pests, it is stated, which might very possibly find entry into the United States, is much larger than those which have already gained entrance, and the unknown foreign pests may perhaps be more dangerous than the known pests already established. These pests are said to be costing the United States each year more than the total value of all imported plants since the founding of the Republic.

DEPARTMENT NEWS.

Mr. W. R. Dunlop, Scientific Assistant on the staff of the Imperial Department of Agriculture, returned to Barbados by the S. S. Median from England on June 19, 1919, to continue his duties in the department consequent on his demobilization from the Royal Navy.

CAMPHOR TREES IN THE WEST INDIES.

In connexion with previous articles on this subject, the following note, forwarded by Mr. W. N. Sands, F.L.S., Agricultural Superintendent, St. Vincent, is of interest:—

At the request of the Imperial Commissioner of Agriculture herbarium specimens of the old camphor tree in the Botanic Gardens, St. Vincent, were recently sent to the Director of the Royal Botanic Gardens, Kew, with the following note by the writer: 'The tree was probably planted by Anderson between the years 1786 and 1806, as Guilding names Camphor as among the plants in cultivation in the Garden in the latter year. The twigs are green and remain so. No flowers have been produced by the tree within my knowledge. A piece of the mature wood examined at the Government Laboratory, Antigua, was found to contain no solid camphor but oil only.'

The Assistant Director of Kew in acknowledging the receipt of the specimens, says:—

'The Camphor you sent exactly matches *Cinnamomum Camphora*, var. *glaucescens*. We have a specimen in the herbarium sent by Guilding from St. Vincent in 1822. It may be that the variety *glaucescens* is always oil-yielding, but on this point we require a deal more evidence'.

In the *Agricultural News* (Vol. XVIII, No. 438), Collens states that in the Royal Botanic Gardens, Trinidad, one tree among those growing there was found to yield oil only, and that 'a field examination of it showed several differences from the camphor-producing type; the petioles and stem were reddish and leaves ovate. On being crushed the leaves yielded a turpentine-like odour somewhat similar to that of mango leaves'. As this form, from the description given, is clearly distinct from the variety *glaucescens*, there may be at least three forms of Camphor in cultivation in the West Indies, only one of which, so far as is known, at present, yields solid camphor; but as pointed out above, additional evidence is required, and it is hoped that this will be obtained as a result of the investigations now being made by the authorities of the Royal Botanic Gardens, Kew.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. The following plant distribution is recorded from the Botanic and Experiment Stations, during the month of May: cured cacao 17 lb.; coco-nut plants, 21; cotton seed, 96 lb.; Bengal beans, 6 lb; bush bonavist, 9 lb. The weather, Mr. Sands states, continued dry, and little could be done on the land except the cleaning up of fields. In a few cases some cotton was sown. A good deal of produce was awaiting shipment. During the month the cotton Inspector and the Foreman visited the islands of Mustique and Battawia, where Sea Island cotton is grown, with the object of ascertaining the conditions that exist during the close season in regard to the cotton stainer and leaf-blister mite. Very few cotton stainers were seen at Mustique, but at Battawia cotton stainers were numerous on ratoon Sea Island plants from cut back stalks, which were boiling and which, on examination, were proved to be infested with internal boll disease. This pest was also breeding on seed-cotton waste thrown in the neighbourhood of houses and on wild ochro recently grown from seed. The campaign against the cotton stainer at Government House grounds was still in progress.

ST LUCIA. Besides making farine and starch, work in the Experiment Stations during the month of May was of a routine nature. Plant distribution included 300 lime plants, 13 Robusta coffee, 157 Liberian coffee, 655 ornamental plants, 6 grafted mangoes, 62 cuttings, 14 packets of vegetable seeds. The Agricultural Superintendent, Mr A. J. Brooks, states in regard to staple crops, that the cacao crop is practically over, the lime crop was now coming in, and reaping operations in connexion with the sugar crop were about finished. The rainfall recorded at the Botanic Gardens, Castries, for the month was 8·24 inches; at Choiseul the record was 5·14 inches.

DOMINICA. Mr. Joseph Jones, the Curator, writes to say that during the month of May, 30 barrels of green limes and 9 barrels of ripe limes were gathered from the Lime Experiment Station. Plant distribution was as follows: limes, 4,725; budded citrus, 15; grafted mangoes, 14; miscellaneous, 117; making a total of 4,871 plants. In addition, 21,000 onion seedlings, 2,000 cane cuttings, 150 shade tree cuttings, and 3lb. Tephrosia seeds were sent out, and 306 packets vegetable seeds sold. The price paid for green limes locally has dropped from 20*s.* to 10*s.* per barrel. The position in regard to ripe limes and by-products remains the same. Referring to weather conditions, Mr. Jones states that some showers fell during the early part of the month, after which dry weather was again experienced in the Roseau district. The rainfall recorded for the month equalled 4·60 inches. The total rainfall from January 1 to date is 11·59 inches.

MONTSERRAT. In notes forwarded by the Acting Curator, Mr. A. Galliwey, work carried out in the Botanic Gardens during the month of May was of a routine nature. Plant distribution included 1,700 lime plants, 1,324 bay plants, 42 papaw plants, 7 grafted mangoes, 12½ lb. peas, 1 lb. Castor oil seed. The average yield of oil obtained from distillations of bay leaves was 16·1 oz. per 100 lb. of leaves. Slight damage to the cotton crop was caused by very high winds experienced during the first week of the month. In addition to the breaking of the stems of several plants, a general cessation of growth was observed, and the plants presented a 'blasted' appearance. Rain is now needed, especially for the early planted cotton which is beginning to flower profusely. The bay trees in the Chateau plot carried a luxuriant growth of fresh leaves during the month, which may partly be responsible for the low yield of oil obtained. The trees are also flowering profusely. Cotton stainers in all stages were seen in few numbers upon the 'twelve o'clock' and other malvaceous plants along the edges of cotton fields. The rainfall recorded at Grove Station for the month was 5·49 inches; the total rainfall for the year to date is 19·20 inches.

ANTIGUA. During the month of May, 3,700 plants of *Agave sisalana*, 2,000 onion plants, 6 miscellanous, and 1,115 lb. of cotton seed were distributed. Work in the Experiment Stations and Botanic Gardens was of a routine nature. The young cane crop, Mr. Jackson states, is beginning to feel the effect of continued dry weather. The reaping of sugar-cane is progressing, and more than half of the crop has been harvested. The onion crop is seriously affected by dry weather. During the month 71,282lb. of cotton were shipped to England. Of this amount 3,564lb. were stained. It is hoped that all the cotton will be reaped and ginned during the month of June. The amount of cotton purchased from peasants by the Antigua Cotton Growers' Association was

3,301lb. of clean lint and 337lb. stained. A few cotton stainers are still found in the island. Mr. A. E. Eldridge has commenced work in connexion with hard back grub (*Lachnosterna* sp.) investigation. The rainfall for the month was 1·80 inches; the total rainfall for the year to date is 13·28 inches. Rain, Mr. Jackson adds, is required throughout Antigua

ST. KITTS. Notes received from Mr. F. R. Shepherd show that plant distribution during the month of May included the following: casuarina, 300; cane plants, 1,100; peanuts, 10 lb.; white velvet beans, 150 lb.; peas, 24 lb. Only routine work was possible in the Botanic Gardens consequent on dry weather. The reaping of the old cane crop is being pushed on, and it is expected that the Factory will finish operations by the end of June. Owing to the heavy rains in April, the estates in the northern district will find it difficult to get all their canes off in time. Syrup making has taken the place of muscovado sugar manufacture to a great extent on estates outside the Factory, and it is contemplated by the American Product Company, who are large purchasers, to erect iron tanks for storing syrup at the port of Sandy Point. The young cane crop has much improved after heavy rains, but showers are greatly needed to help on the late supplies. The rainfall for the month was 1·15 inches; for the year to date, 12·64 inches.

VIRGIN ISLANDS. Mr. W. C. Fishlock, Curator, Tortola, writes to say that the weather in May was favourable for planting cotton but no suitable seed was available at the Experiment Station. Planting was thus delayed to some extent. Some persons are believed to have planted seed of their own saving, while it is reported that two individuals imported seed for sale. There appears to be a continuation of revived interest in the industry. The Porto Rico May beetle has been quite common; no other serious pests have been reported. The weather during the month was dry. The total rainfall at the Botanic Station was 1·92 inches, as compared with 4·76 inches, the average for the month for the preceding eighteen years.

AGRICULTURE IN BARBADOS.

In spite of the showers which fell on the last day of May, the rainfall for the month was under 2 inches, while last year the total for the same month was only slightly under 5 inches. We need a soaking rain to refresh vegetation and to enable a start to be made with tillage and planting.

No difficulty has been experienced this year in harvesting the crop, and the few windmills which are still at work have had an excellent fortnight for the ingathering of their last acres. Only here and there now are there estates with anything more than a moderate acreage outstanding

Each of the three seedlings, the B. 6450, the Ba. 6032 and the B.H. 10 (12) has, we believe, held its own. We have heard one or two planters speak of the first named as a star that has begun to set, while again we have heard others speak of the same seedling as being yet in its youth with, a promising future before it. We are inclined to think that with careful treatment this seedling will yet awhile render a satisfactory account of itself.

Of the Ba. 6032 we have heard excellent accounts as to tonnage and quality of juice. This seedling we are sure will be more and more grown especially in non-ratooning districts. In addition to its other qualities, it does not rot as readily as the B. 6450 after reaching maturity. Its upright characteristic and its hardness of rind ensure for it a preservation which cannot be claimed for the B.6450. We know of an estate which kept a field of plant canes of this seedling as the last to be reaped, and it yielded about 41 tons per acre, the percentage of diseased canes being very small.

The B.H. 10 (12) has further established its reputation this season. The planting of this seedling will also be extended, particularly in the red soil, because of its ratooning powers.

There are but few nurseries established for the next planting season. We know of some planters who have planted three times over the spots which had been prepared for this purpose. This means that at the next planting season recourse must be had to the fields for next year's crop for the needed supply of plants.

This season has proved the absolute superiority of farmyard manure over organic manure for the support of the cane plant during a prolonged period of unfavourable weather. Disease, we are pleased to be able to state, has not developed to any extent. It is simply the lack of moisture which has reduced the young crop to its present condition. To us it seems wonderful that any life remains.

The ratoons in the red soil are keeping green and are also bunching satisfactorily. The first application of chemical manure has been generally made as soon as the stumps had made a start. We have noticed a few spots of particularly healthy B. H. 10 (12) ratoons, and even where this seedling was cut early in the season, its advanced stage has not been marked by the development of yellow blades.

There has been no difficulty nor delay in obtaining sulphate of ammonia, and nitrate of soda also is now available. Soda is preferred for the first application to ratoons where potash cannot be obtained, and planters have been glad to get it to complete their first application.

With the completion of the crops attention is being immediately paid to the carting out of the manure collected in the yard pens. Some of this is being applied to fields of young plant canes for which there was not a sufficient supply when the crops began. The remainder will be utilized for the forcing of field pens for the next planting season.

Planters will find it more difficult than usual this year to raise a satisfactory supply of manure, owing to the fact that the yield of tops has been extraordinarily poor. This also will make it difficult to feed the animals until the pastures are ready to be cut.

With the showers which fell during the early days of May some early yams were planted, and we are glad to be able to state that they are springing satisfactorily. It has been impossible to plant potatoes, but small spots of corn and fodder have been sown. Potatoes are now being sold at 3c. per lb., and their scarcity increases day by day. (The Barbados *Agricultural Reporter*, June 14, 1919.)

During the past few years a new tick, *Ornythodorus megnini*, a native of America, has made its appearance in South Africa, and has spread more especially over the drier parts of the country. This tick attacks all domestic animals, and occasionally man himself, but is chiefly noticed on calves, and always invades and inhabits the ear only. Messrs. Cooper & Nephews have made a special preparation—(Cooper's Ear Tick Remedy), for destroying this tick It is applied by means of an ingenious device, the Cooper pourer, into the ear. (The *Rhodesia Agricultural Journal*, April 1917

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended May 31, 1919, is as follows:—

ISLANDS. Since our last circular report of May 10, there has been a good demand for Extra Fine, resulting in the sale of the greater portion of the Planters' crop lots and the limited offerings of the odd bags, at prices ranging from 62c. to 82c., f.o.b. and freight, the buying being on account of the Southern Mills, and for export for France, the sales aggregating about 200 bales.

During the past week there has sprung up a demand for the lower grades, taking upwards of 150 bales on a basis of 42c. to 44c., f.o b. and freight, the buying being on account of the Northern Mills.

The unsold stock is now very much reduced, and consists of crop lots of Extra Fine, aggregating about 200 bales and odd bags of the lower grades, about 150 bales together with some small lots of Medium Fine held off the market.

We quote, viz:—

Fine to Fully Fine, @ 53½c. to 55c. f.o.b. and freight.
Extra fine @ 62½c. to 82½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. The limited offerings have continued in demand at hardening prices, there being an urgent demand for the better grades, Extra Choice and Fancy, of which the offerings are very small. There is a very firm feeling prevailing, and the larger portion of the unsold stock is being held off the market in expectation of much higher prices being paid, before the next crop is marketed.

We quote, viz:—

Extra Choice to Fancy, @ 55½c., f.o.b. and freight.
Average Extra Choice, @ 54½c., f.o.b. and freight.

with only small offerings.

The exports from Savannah since May 10 have been to the Northern Mills 999 bales, Southern Mills 140 bales, and from Jacksonville to the Northern Mills 152 bales.

CROP ADVICES. We have only to confirm what we have previously advised as to the decrease in acreage planted. In Carolina it is estimated that there will be 25 per cent. to 30 per cent. less planted, and in Georgia about 50 per cent. less than last year on account of the fear of the boll weevil. We will have to wait for the Government report before we can get any very reliable information. However, there is no doubt that the coming crop will fall much short of the last.

N.B.—We will not issue another circular report until June 28.

OFFICIAL COTTON STANDARDS OF THE UNITED STATES.

The development of the American-Egyptian cotton in the Salt River Valley of Arizona and some districts of California has been referred to in several previous issues of this Journal There are two varieties of this cotton which are cultivated in these districts, namely Yuma, which has a staple from $1\frac{7}{16}$ to $1\frac{1}{2}$ inches in length, and the Pima with a staple of from $1\frac{5}{8}$ to $1\frac{3}{4}$ inches.

According to the Service and Regulatory Announcement No. 41 of the Bureau of Markets of the United States Department of Agriculture, it has been decided to replace the tentative standards for this cotton with the official cotton standards of the United States. Hitherto the grades of American-Egyptian cotton have been designated by the names Fancy, Extra, Choice, Standard, and Medium. In the Official Standards numbers are substituted for the grade names—No. 1 for Fancy; No. 2 for Extra; No. 3 for Choice; No. 4 for Standard; and No. 5 for Medium.

Furthermore, American-Egyptian cotton which in grade is between any two of the standard grades, is designated by the number of the higher followed by ½; for example, cotton between grades No. 1 and No. 2 is grade 1½. Also, cotton inferior to grade No. 5 is designated as below grade 5.

The grading and stapling of 2,100 bales of the 1917 crop were done, as is stated in an article in the *India Rubber World*, May 1, 1919, from which the foregoing information has been obtained, by a representative of the Bureau of Markets of the United States Department of Agriculture, and material was collected for designation of types. The lengths of staple formerly known by numbers are now designated by their actual measurements.

According to the article referred to, standards for Sea Island cotton are also established. As in the case of American-Egyptian cotton, numbers are substituted for grade names in the standards for Sea Island cotton: No. 1 for Fancy; No. 2 for Extra Choice; No. 3 for Choice; No. 4 for Extra Fine; No 5 for Fine; and No. 6 for Medium Fine Sea Island cotton which in grade is between any two adjoining grades is designated, as in the case of American-Egyptian cotton, by the number of the higher grade followed by ½. Similarly cotton inferior to grade No. 6 is designated as below grade 6. The length of staple will also be designated by their actual measurements.

As different methods of pulling staple may cause variations in result obtained by different classifiers, the Bureau of Markets has devised a method, the adoption of which it recommends in the document referred to above.

MONTSERRAT: REPORT ON THE AGRICULTURAL DEPARTMENT, 1917-18.

Considering that the prosperity of Montserrat appears to be, at present at least, intimately related to the production of superior cotton, the report under consideration is naturally devoted to a large extent to this crop. It may be said that the scientific and careful efforts made by the officers of the Department, in maintaining and improving the good type of Sea Island cotton now grown deserve special commendation.

There are three strains of Sea Island cotton under trial in Montserrat. These are being experimented with in order to ascertain what strain will give the most satisfactory return both with regard to spinning tests and to field characters, such as yield and resistance to disease. As Mr. W. Robson, the Curator, says in his report, 'were the value of a cotton from the grower's point of view to be decided on the value of the lint only, then spinning tests would once and for

all decide upon the right cotton for cultivation, but as the field characters of strains, that is the yield and other points, are of more importance from the grower's point of view, to decide on the relative values of strains for general cultivation becomes much more complicated. It is with reference to these points that the cotton experiments are being carried out in Montserrat. The three strains experimented with, after a process of selection, are known as H. 9 and H 25, derived from a strain cultivated for some years in Montserrat; and D. 1, a fine strain of St. Kitts cotton.

With regard to the spinning tests of these cottons, Mr. J. W. McConnel, Vice-President of the Fine Cotton Spinners' and Doublers' Association, Ltd., reports that all of these three cottons in each test were very satisfactory indeed, and were very much better than our ordinary mixing, and that, on the whole, the Department is to be congratulated on the report about these three cottons.

Mr. Robson considers that at present the H. 23 strain of cotton promises to be the most profitable for cultivation, though the valuations of the lint actually show that the D. 1 type is of the highest value. The objection to the D. 1 type from the grower's point of view is the relatively low percentage of lint, and the small size of the boll.

The careful selection of seed to supply the cotton growers, so as to prevent a deterioration in the type, is worthy of commendation, and it is to be hoped for the future of the industry that this will be carefully continued.

The area planted in cotton in the year under review was about 2 600 acres, and the total amount of lint produced was 409,855lb., the largest output recorded for the island, giving an average yield per acre of 157 lb. of lint, considerably in excess of the average yield of 146 lb. per acre for the previous fourteen years. The return on the larger estates per acre were below the average of the previous year, and the inference from the improved results for the whole island is that much better returns have been obtained from the areas planted by small landowners. The activities of these small growers received a considerable stimulus owing to the high prices obtainable for Sea Island cotton, which was purchased by the Government for war purposes. The price paid for seed-cotton rose to 10*d.* per lb. early in the season, although near the end of the crop it dropped to 7*d.* As the highest price previously paid for seed-cotton was 4*d.* per lb., it is no wonder that interest in the crop was much stimulated. It is estimated that the amount of money put into circulation amongst peasant cultivators as the result of the 1917-18 crop of cotton was £20,000.

Twenty years ago it would have been said that Montserrat was almost dependent upon the lime industry. To-day it would appear that the lime industry is not half the value to the island of the cotton industry. In fact according to the report under review, there seems to be not only no extension of lime cultivation, but rather a fear that it will continuously decrease in the future. It has been stated by lime planters that there has been a definite change in the climatic conditions existing in Montserrat since the hurricane of 1899, but there does not appear to be any definite reason to believe that this has been the case. Mr. W. Nowell, Mycologist on the staff of the Imperial Department of Agriculture, has also recorded his opinion, that there is no foundation for the idea that Montserrat is troubled by any specific and special disease of lime trees as compared with other islands, such as Dominica. The reason for the decline in the amount of land under lime trees is probably owing to the fact that new areas are not being planted when the older cultivations have become exhausted, and also that proper systems of of cultivation in the existing areas have not been sufficiently attended to. For instance, in the lime experiment plot it has been definitely shown that the planting of shelter-belts of gliricidia and pigeon peas has resulted in the greater vigour of the young lime trees. This has also been proved by the experiments at the Dominica station.

Up to the middle of the last century the chief industry in Montserrat, in common with most of the smaller West Indies, was the cultivation of sugar-cane. In later years this has become an almost negligible factor in the agriculture of the island, and although owing to the high price of sugar in the last three years, a partial revival of sugar-cane cultivation seems to have taken place, it does not appear likely to be much further extended.

Mr. Robson's work with regard to the cultivation of bay trees for the distillation of bay oil is noteworthy. He has demonstrated that the cultivation of the proper variety of bay trees (*Pimenta acris*) is not only profitable, but comparatively simple. In 1908 one acre was planted at the Botanic Station in bay trees, at a distance of 9 feet × 6 feet, giving about 800 plants to the acre. Two and a half years after the trees were planted, reaping of the leaves was begun, and it has been systematically continued since that time, the estimated value of the product per acre having risen from £7 in 1911 to £46 in 1917. No cultivation has been given to the plot except occasional cutlassing, and as the trees have increased in age they have so closed in and covered the ground that very little cutlassing is now necessary. In the earlier years the twigs were cut off by the use of garden secateurs, but now that the trees have increased in size and vigour, it is found necessary to behead them, by making use of a saw, at about 6 feet from the ground, the leaves being afterwards stripped from the branches. This was, as Mr. Robson says, really a pioneer effort in the scientific cultivation of the bay tree for the sake of its leaves, and he is to be congratulated on the results he has obtained.

In previous issues of this Journal notice has been taken of the cultivation of the Ajowan plant and the American horsemint as sources of thymol in Montserrat. The analyses made of these products appear to show that hey might be profitably grown, if they could be locally distilled.

The usual experiments on ordinary ground provisions are carried out, and it is hoped that Montserrat will regain its reputation of being almost a self-supporting island in the matter of locally grown foodstuffs.

One minor industry which is peculiar to the island among the West Indies is the production of papain. This shows a falling off in the year under report as compared with previous years, probably the result of the superior profits derived by small planters from the cultivation of cotton.

The *Experiment Station Record* (Vol. XL, No. 3), has a note on the value in Florida of tangelos. Tangelos originated as a result of crosses made by the Department of Agriculture between the tangerine orange and the grape fruit. The success of the first two hybrids has led to the creation of hundreds of additional hybrids between all the manderin types of orange and the better types of grape fruit and pomelo. There is reason to believe that some of these tangelos will be found decidedly resistant to citrus canker, and hence the expected value of them to citrus growers in Florida.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the development of a mineral oil industry in the West Indies, pointing out that the position of depending entirely upon planting is now altered.

The mango tree borer (*Batocera rubus*), a recent introduction into the West Indies, is dealt with under Insect Notes, on page 202. A second article under these notes treats of the protection of stored grain from insect attacks.

The Mycologist's report on the investigation of the froghopper pest and disease of sugar-cane in Trinidad, the first two instalments of which have been published in this Journal, is continued under Plant Deseases on page 206.

Poultry Manure.

This manure is rich in plant food, and if properly dried and stored in sacks or casks is said to be worth about four times as much as farmyard manure.

A note in the *Journal of the Department of Agriculture of Victoria*, Australia, March 1919, points out that since the advent of the motor car, stable manure is becoming scarcer every year, and it is worth while for all who keep fowls to save the manure. Even the small poultry keeper should methodically save it, for a little concentrated manure is a very handy thing to have for a small garden. It should never be used fresh, as its value is about double when it has been allowed to dry. Once dry, if not wanted for immediate use, it is best stored in a barrel, mixing in a little soot with a covering of dry soil placed on the top. An excellent liquid manure can be made by mixing some of the contents of the barrel with an equal quantity of soot, putting it in a piece of sacking and soaking it in water for a few days. About an ounce of dry manure and an ounce of soot are usually sufficient for a gallon of water to provide a liquid manure suitable for use with the majority of vegetables.

Some Difficulty in Enforcing Plant Quarantine.

The *Hawaiian Forester and Agriculturist*, March 1919, states that for a long time a great many ships coming from Europe into the Port of New York have been dumping earth ballast along the shores of East River, Hudson River, and elsewhere around the bay. This is a source of risk of the entry of undesirable plants and plant pests, in the opinion of the United States Departments of Agriculture, and an inquiry has been started to determine the extent of this risk, and to provide safeguards against it. Besides the likelihood of the introduction of undesirable weeds by means of seeds in the earth ballast, there is a possibility also of the introduction of injurious nematodes and hibernating insects, the pupae of which might be in the soil, and any of which, unless preventive measures are taken, might spread over a considerable part of the country, and cause much damage to the agriculturist.

Susceptibility of a Non-Rutaceous Plant to Citrus Canker.

Under Plant Diseases in the issue of this Journal for May 3, 1919, the observations of Mr. H. Atherton Lee, of the Bureau of Plant Industry, United States Department of Agriculture, on the susceptibility of certain rutaceous plants to citrus canker were noted.

More recently inoculations of plants outside of the Rutaceae have been attempted. A note in *Science*, May 23, 1919, records that needle punctures made through a suspension of *Pseudomonas citri* placed upon the actively growing midribs of leaves, and upon the petioles and main stems of *Lancium domesticum*, have produced swellings which cracked later, and eruptions of tissue have resulted. In some cases the swellings have been surrounded with the yellow halo typical of canker upon citrus hosts. This plant is a

tree cultivated in the Philippines for its edible fruit, and belongs to the order Meliaceae, a typical plant of which is the West Indian mahogany.

This result is recorded as of possible interest in throwing new light on the character of the canker organism. It is conceivable that circumstances might produce extreme optimum conditions for the development of the canker which would lead to infection of highly resistant host plants, which under ordinary conditions would be regarded as immune. Lesions on such hosts would then be capable of serving as sources of reinfection to citrus plants.

Soy Beans.

Although soy beans have been cultivated for many centuries in China, Japan, and Korea, and used very largely as human food in those countries, it is only within recent years that the beans have assumed importance in Europe or America, although it is stated in an interesting article on the subject in the *Bulletin of the Imperial Institute* (Vol. XVI. No. 4) that the cultivation of soy beans in England is recorded in 1790, and the beans were mentioned in the United States as early as 1804.

The article referred to above contains much information relating to the soy bean industry in the United States. The beans were first grown as a forage crop, but attention has more recently been paid to the cultivation and production of the bean as a source of oil, cake, and food. The limits of adaptability to climatic conditions are similar to those of maize, and the crop is said to be capable of successful cultivation on most types of soil. In the United States, the cotton belt and the southern portions of the corn belt seem to be most favourable for soy beans, though some of the improved varieties do well farther north.

As a forage crop soy beans form an excellent pasture for swine, while the hay is relished by all animals. The soy bean is said to be superior to the cowpea as a forage crop, being easier to handle and more nutritious, and appears in some districts to be replacing the latter. Soy beans can be pressed in cotton seed oil mills without any appreciable change in the mill equipment. It is stated that 1 ton of beans is estimated to yield from 28 to 31 gallons of oil, and 1,600 lb. of meal.

Soy bean oil in an unrefined condition was at first mainly used for the manufacture of soft soap, but at present it is being largely employed in the manufacture of butter and lard substitutes. The meal after extraction of the oil is used both as a cattle food and a human food. As a human food, until recently, soy bean meal has been used chiefly in the preparation of special foods containing only a small amount of carbohydrates. It has, however, been shown that the meal can be advantageously employed in the proportion of 1 part to 3 parts of wheat flour in making bread, pastry, etc

The whole beans are also of value as human food, and one canning firm in 1916 utilized about 100,000 bushels of soy beans for the production of 'baked' beans. The immature green pods form a useful green vegetable, and have also been canned successfully.

Rosella Fibre.

The Board of Trade Journal, February 27, 1919, draws attention to experiments being made in Paraguay in the production of fibre from the rosella plant, *Hibiscus sabdariffa*, known in the West Indies as 'sorrel'. It appears that conditions of labour in Paraguay will not admit of this fibre competing with jute, but it is expected that it may be used locally as a subtitute. A trial has been made in planting 100 hectares, 1 hectare carrying 12,000 plants. The plant withstands both drought and excess of rain without suffering, and locusts do not eat it. Each plant gives from 350 to 500 grammes of dried fibre, so that making due allowance for possible losses, 4,000 kilos of fibre per hectare may be expected. The plant is easy to cultivate, and local agriculturists are willing to deliver the growing plant ready to cut at a reasonable rate. For fibre delivered in Buenos Aires offers have been received of about £280 for 4,000 kilos. The removal of the fibre from the plant is exceedingly simple. The plant is left to soak in water for four days, and the fibre comes off easily. The pulp of the plant serves as a material for paper making. Although the paper factory at Buenos Aires has given a large order for pulp, this cannot at present be fulfilled owing to prohibitive freight rates.

Utilization of Banana Stalks.

An article on another page of this issue, on the value of megass for paper making, notes that by the combination of megass with banana pulp white paper of fine quality can be turned out. In *Sugar*, March 1919, it is stated that a new industry that will be of benefit to the sugar planters in Hawaii, is a sack factory shortly to be started. The sacks are to be made of banana fibre shipped from the coasts of the Caribbean through the Panama Canal. The estimated output of the factory will be 10,000,000 sacks per annum.

It is also stated that there has just been finally perfected in Honolulu a machine which will separate the fibre, from the pulp of banana stems. As is well known, after the fruit is cut, the stem of the banana plant either dies of itself, or is cut away. For lack of a machine capable of dealing with these stems the valuable fibre contained in them has hitherto been wasted. The ordinary banana acreage is given as from 400 to 600 plants. From each of these it is expected that 2 lb. of fibre can be extracted by the newly invented machine. Besides extraction of the fibre the same machine separates the pulp which will make, as was mentioned above, an admirable ingredient in paper stock.

Considering that a banana plant consists of about 93 per cent. water, 3 per cent. fibre and 4 per cent. pulp, and that the fruit from 85,000,000 banana plants was consumed in the United States alone last year, it will be seen that there appear to be great possibilities before this new industry, both in the production of fibre and in the utilization of the pulp in paper manufacture.

INSECT NOTES.

BATOCERA RUBUS.

The Department of Agriculture, Mauritius, has issued *Leaflet* No. 10, entitled The Mango Tree Borer (*Batocera rubus*). This insect is a recent introduction into the West Indies, and on this account the information given in the leaflet is likely to be of interest to readers of the *Agricultural News*.

The first record of the occurrence of *Batocera rubus* in the West Indies appears to be the account in the *Proceedings of the Agricultural Society of Trinidad and Tobago* (Vol. XI, p. 342), when Dr. Fredholm stated that this insect had made its appearance in Trinidad and in St. Croix, and that it might prove a troublesome pest if it should become established and be spread to other islands.

Accounts of this insect were published in the *Agricultural News* (Vol. X, p. 298, and Vol. XV, p. 74) Since that time *Batocera rubus* has become known in the Virgin Islands, where it seems to be well established.

According to *Leaflet* No. 10, this insect is known in Mauritius as the Mango tree borer because it is responsible for considerable damage to mango trees in that island. It is called 'Violin' because of the peculiar noise it makes when irritated. The noise is produced by the rubbing of the posterior part of the thorax on a small, smooth, black strip provided with ribs across it, and which is in front of the scutellum. This strip is hidden from sight when the beetle is at rest.

This is said to be the largest beetle found in the colony of Mauritius, and the following description is given of it. It is from 50 to 55 mm. long and 18 mm. wide at the base of the elytra. It is of a chocolate brown colour, more or less covered with an orchreous, short, thick pubescence, which is easily rubbed off and is less noticeable on the antennae and legs than on the body. The antennae of the male are very long reaching to the extremity of the abdomen; the female has shorter antennae.

The thorax and the base of the elytra are provided laterally with a strong spine. There exists on the middle of the thorax two large, irregular, red spots slightly reniform, which are contiguous at the apex, and diverge posteriorly. The base of the elytra is very rough, and covered with small granulations. The scutellum is of a pure white colour. There exists under the body and along its sides a large white stripe which slightly encircles the eye, and continues up to the pygidium or last abdominal segment. The larva is a large grub, cylindrical in shape, of a creamy white colour, reaching a length of 75 mm., and a width of 18mm. at the widest part of the body which is the thorax, the three segments just behind the head. From the thoracic segments the body tapers off gradually to the last segment. The grub is footless and blind. It lives in the wood and under the bark of the trees attacked.

The eggs are deposited by the female beetle singly in cracks and crevices in the bark. The young larvae remain in the bark for the greater part of their lives. The galleries which they bore are irregular, narrow, and sinuous. When they are 40 to 45mm. long they bore into the wood and make larger, circular galleries which finally reach the outer surface of the tree immediately beneath the bark, where they transform into pupae and adult insects.

Although they are concealed in the trunk and branches of the mango trees, their presence is easily detected by the brownish fluid which trickles out from the wound. When they are still under the bark, the tree can be treated and saved from destruction; but when they are in the wood there are no practical means whatever of destroying them.

The life of the larva has not yet been ascertained, but there is ground for believing that it is not less than a year. The adult insect or beetle is found all the year round, but in greater numbers in summer, at which time the first attacks of the larvae are noticed.

Control measures include the collecting of the beetles and the destruction of the larvae. In the case of trees in which the borers are under the bark, and have not penetrated into the wood, the grubs may be dug out and the galleries cleaned of debris to promote more rapid growth of new tissues.

Trees which are too badly attacked to be saved should be cut down and split up into small pieces so as to get out all the grubs. Logs or large pieces of such infested trees, or dead trees if left standing, will continue to breed these insects, or at least all the grubs in them will be able to complete their development, and come out as beetles.

This borer is stated to occur in Madagascar and Réunion as well as in Mauritius, and to attack, in addition to the mango, the Banyan tree, the Golden Apple (Fruit de Cythére), the Bois Noir, and to show a marked preference for the Kappok tree, the cultivation of which has been given up in the colony as a result of the attacks of this insect.

Batocera rubus is a native of the East; it occurs in India, Ceylon, and sometimes in Africa, in addition to the localities already mentioned. In the West Indies it is recorded in Trinidad, St. Croix, Tortola, St. Thomas, and Jost van Dykes.

The grubs of this species attack the following trees: *Ficus elastica* and other species of Ficus, the hog plum (*Spondias lutea*), avocado pear (*Persea gratissima*), mango (*Mangifera indica*), silk-cotton (*Eriodendron anfractuosum*), cork wood (*Ochroma lagopus*). It is reported as having been a serious pest of coco-nut trees in Ceylon, and to have occasionally attacked Para rubber (*Hevea brasiliensis*) in India. It also attacks the papaw (*Carica papaya*).

In July 1916, an attempt was made in Tortola to collect certain insects with the view of finding whether they were present in large numbers. One of these insects was *Batocera rubus*, and in four days a few children collected 266 of these beetles, which were paid for at the rate of one cent each. This would indicate that the insect is fairly common in Tortola.

PROTECTION OF STORED GRAIN FROM INSECT ATTACKS.

The need for the utmost conservation of foodstuffs as a result of war conditions induced investigation into the means to be adopted for preventing the losses which have in the past been so prevalent in the case of stored grains.

According to an article in *The Times* for February 21, 1919, Prof. H. Maxwell-Lefroy gave an interesting talk at the Royal Institute on the protection of stored wheat in Australia against the attacks of weevil.

At the request of the Wheat Commission, Professor Maxwell-Lefroy went to Australia to endeavour to save the large quantities of grain which had accumulated there awaiting shipment, and which was being severely attacked by insects, and to devise means of protecting the new crop from attack. The problem had to be considered in two parts: one, the prevention of attack in the case of grain free from insects; and the other, the cleaning of the infested wheat, and the killing of the insects in it.

The weevil attacks started in the scattered grain on the ground, where the moisture conditions were favourable, and then extended to the stacks. The trouble was largely due to the faulty construction of the stacks, and the action of mice, which cut the bags and allowed the grain to scatter on the ground.

Great success followed simple changes. The railway sleepers on which the stacks were made were properly spaced so as to give the necessary ventilation, naphthalene was used to prevent insects breeding on the ground in spilled wheat, and the roof was properly constructed before the stack was made. When he sacks were all in, and the stacks complete, the sides were closed with cloth. This was very successful, and new wheat stored in this manner came through the season in excellent condition.

The case of infested grain was different. The insects had to be killed to prevent further damage, and the grain had to be cleaned to make it fit for human consumption. It was found that the application of heat was the most satisfactory method of killing the insects. A temperature of 145 degrees Fahrenheit, maintained for three minutes, killed all the insects in the wheat. The grain was not injured by a temperature of 158 degrees.

Machines for heating the grain and cleaning it of weevils were in operation, one of these being capable of treating 20,000 bushels of wheat a day.

H. A. B.

SUGAR INDUSTRY.

IMMUNE VARIETY OF SUGAR-CANE FOR PORTO RICO.

An account of a serious new cane disease in Porto Rico, known as mottling or Mosaic disease, was published in the *Agricultural News* for September 8, 1917, at page 289. In this article it was stated that practically all varieties, and particularly the Bourbon were affected. The disease did not appear to be caused by any specific organism; nevertheless the trouble was of a highly infectious character. The losses caused were very great, sometimes resulting in the destruction of the entire crop.

In connexion with the above remarks, a letter in a recent issue of *Science* (May 16, 1919) which deals with a Japanese variety of cane found to be immune to this disease in Porto Rico, is of great interest. It appears that at the Federal Experiment Station in Porto Rico, out of twenty varieties growing there one only, the Japanese variety, Kavangire, showed no sign of the mottling disease. Further trials conducted there by Mr. H. Bourne of Barbados, under the direction of Professor Earle, showed that this particular cane was the only one that could be relied upon to resist infection after inoculation.

The Kavangire cane is tall growing and very slender, but the yield, under some conditions at least compares favourably with other varieties. A yield of 70 tons per acre for this cane is reported for one plot. No analysis of the Kavangire variety, as grown in Porto Rico, are available, but according to some reports from other countries where it is grown it varies from 14·38 per cent. sucrose to 16·85 per cent sucrose, while its purity coefficient varies from 84·9 to 89·67.

This variety appears to have given satisfaction in those parts of the Argentine where the warm weather extends over a sufficiently loug period to enable it to mature. But on account of the fact that it requires a long season for maturity, it is not recommended for cultivation in sub-tropical countries. In conclusion it may be added that this cane appears to be a strong ratooner and to have considerable resistance to root disease, borer, and stem rot.

CANE PLANTING ON THE FLAT IN ST. CROIX.

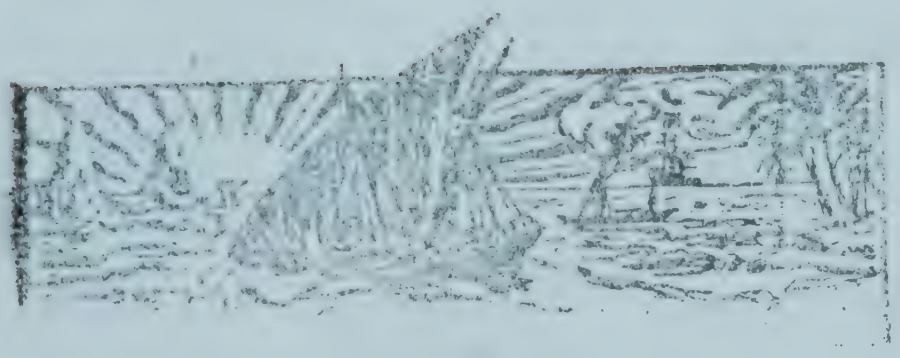
In the *Agricultural News*, May 18, 1918, there was published a note on experiments on sugar-cane cultivation at the Slob Experiment Station, St. Croix. The manager of the station, Mr. Edward Gedde, has recently forwarded to the Imperial Commissioner of Agriculture for the West Indies, a copy of his report on experiments carried out on similar lines during the season 1918-19.

From this report it would appear that Mr. Gedde is convinced that the results of two previous years with regard to the advantage of planting cane on the flat as compared with planting between banks have been fully confirmed. Under varying conditions of manuring, etc. the result from planting on the flat has in every case been a larger yield of plant canes though not always of ratoons. Besides this, the cost of cultivation on the flat is considerably less than that between banks, thus producing increased profit on the crop. The figures given for eighteen plots on each system are: flat planting, 27·8 tons of cane per acre; between banks, 23·7 tons per acre. The expenses of cultivation were per acre $38·88 for flat planting, and $49 76 for planting between banks.

Experiments as to the effect of pen manures stored in various ways are of much interest. The questions of the advisability of allowing cane fields to lie fallow, of the effects of various green dressings, and of the benefits accruing from rotation of crops are also receiving attention.

The result of one experiment, namely the disposal of the cane trash, might have been predicated. The trash on one field was removed, while that on another was burnt, and the ash turned in. In the following crop the latter produced, as might have expected, a higher yield, for although some valuable constituents were doubtless lost by burning, yet the ash contained much fertilizing matter. It would seem that the system of using the cane trash as a mulch for the growing canes, which is generally practised in many of these islands is probably the best way of utilizing this material.

These experiments, which have now been conducted for three years, will be of increasing value if continued, and will prove as a basis of reliable information not only for the sugar-cane planters of St. Croix, but for those in other places as well.



GLEANINGS.

The wonderful size of some of the Cuban sugar factories may be understood from the fact noticed in the *Louisiana Planter*, May 26, 1919, that on April 10 in twenty-four hours, Central Chaparra ground 7,017 tons of cane, and filled 7,580 bags of sugar each of 325 lb., thus breaking the world's record for amount of cane ground and bags of sugar filled in that time.

Swine raising ought to be made the leading live stock industry of the Philippines, inasmuch as hogs are economical feeders, can subsist largely on by-products of local industries, and find a ready market even in small communities. The native hogs should be given better care, better feeding and management, and better quarters than they commonly receive. (The *Philippine Agriculturist*, October 1918.)

The production of cane sugar in Louisiana for the season beginning in the fall of 1918 was 561,800,000 lb. as compared with 487,200,000 lb. in 1917. The cane crushed amounted to 4,170,000 tons in 1918, or an average of 135 lb of sugar per ton of cane. The average yield of cane per acre in 1918 was 18 tons, and the estimated area harvested for sugar making was 231,200 acres. (The *Louisiana Planter*, May 10, 1919.)

Peru, where the sugar crop in pre-war times was about 170,000 tons obtained by means of irrigation, has at present by the extension of this system a crop of 250,000 tons, and there is in view a further considerable extension of the sugar area. These sugars are much appreciated by refiners, and a considerable proportion find their way to British refineries via the Panama Canal. So rich are the canes said to be in sucrose that a result of 4 to 5 tons of sugar per acre is obtainable. (*Sugar*, March 1919.)

The problem of rat destruction is always one of importance to agriculturists. A note in the *Journal of the Jamaica Agricultural Society*, March 1919, is worth being reproduced for general information. Mr. L. A. Wates, Agricultural Instructor, states that he has been credibly informed that a mixture of 1½*d.* worth of Epsom salts to one and a half large coco-nuts grated and pounded together and dropped about a potato field which has been badly attacked by rats had proved most efficacious. It was stated that the rats ate it readily, and that it was very rapid and effective in killing them, and that, moreover, the mongoose also ate it and were poisoned by it. This is such a simple remedy and cheap that it might be worth while experimenting with in other islands.

The war has wrought a tremendous change in the sugar industry of Germany, which once supplied not only its home market, but also half the requirements of Great Britain. To-day the German people are restricted to a meagre allowance of sugar, and there is no probability that this year's sugar crop will be much above half the normal pre-war production. Either Germany will have to import sugar this year, or its people will be compelled to continue on sugar cards. (*Facts About Sugar*, May 24, 1919.)

It is estimated officially that there are about 52,000 acres under clove cultivation in Zanzibar and Pemba, which between them provide three-quarters of the world's supply of cloves. On this acreage it is estimated that there are about 4,700,000 trees in bearing. The output varies considerably, the trees bearing heavy crops every three to five years. The average output of recent years has been about 14,000,000 lb. of dried cloves. The average yield per annum from a plantation of about 3,000 trees about sixty years old, owned and managed by Europeans, is 8 lb. of dried cloves per tree, ninety-eight trees being planted to the acre. (The *Field*, April 26, 1919.)

A note in *United Empire* for May 1919 remarks that it is disappointing to find that, in the case of a staple product like coffee, the British Empire produces less than one-ninth of the world's present output. The continuous demand for coffee undoubtedly calls for greater production, and in the opinion of experts there are places within the Empire, Queensland for instance, where conditions are eminently suited for the cultivation. Probably the best variety to encourage is that grown on the estates of the Blue Mountains in Jamaica. Queensland presents splendid opportunities for growing the choicest coffee, and might well become a future rival to Brazil in the markets of the world.

Divi-divi is the commercial name for the astringent pods of *Lebidibia coriaria*, a small tree of the order Leguminosae. A note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, December 1918, draws attention to the export of this product, which is used as a tanning material, from the Republic of Santo Domingo. The trees grow wild in certain drier districts of the Republic, and whole families of the poorer people devote their entire time to gathering divi-divi beans, and bringing them to market. The annual export formerly exceeded 2,000,000 lb., but of late they have fallen below this figure. Prior to the war divi-divi was exported to Hamburg almost exclusively, but since the war began it has found a ready market in New York, where it brings from $50 to $55 a short ton.

An article in the *International Sugar Journal* for May 1919, on American sugar production, states that a subject of much speculation in the trade press is the effect which the prohibition of the manufacture and sale of spirits, wines, and malt liquors after July 1 will have on the consumption of sugar. It is generally agreed that a marked increase in the use of sugar will follow, because sugar is regarded as the natural substitute for alcohol on account of its rapid assimilation by the body and its marked stimulating and energizing qualities. A great expansion in the sale of confectionery and of the various 'soft drinks', in the manufacture of which sugar is employed, is anticipated. Many brewing and distilling companies are planning to convert their plants into establishments for satisfying this expected demand.

MEGASS FOR PAPER MAKING.

An article by Dr. Walter Baunard, published in *Sugar*, March 1919, on 'making money from bagasse', gives some suggestions as to the possibilities of utilizing megass more profitably than as a fuel.

In the first place it is pointed out that new discoveries or sources of fuel oil will, in all probability, cause a considerable drop in its price. In the second place, new processes connected with the burning of soft coal and lignites may probably enable factories to operate more economically with such fuels than in the past.

Attention is also drawn to a report from the Philippines that it has been found, after a series of experiments, that the fibre of banana stems when mixed with either bamboo or megass fibre furnishes an excellent material for a very high quality of white paper, which can be profitably manufactured in tropical countries, not only for local consumption, but for export.

The connexion of the possible reduction in cost of fuel and the value of megass fibre for paper making is of the utmost importance to sugar factories in the West Indies, suggesting whether a better use cannot be made of megass than burning it as fuel in their furnaces.

The actual value of megass when used as fuel in the furnaces of sugar mills depends entirely on the locality. It has been estimated that in some cases megass may be considered worth for this purpose $3 per ton. On the other hand, it is also estimated that in certain other localities megass cannot be worth more than $1 per ton. It is therefore very difficult to determine the average value of megass in sugar-cane countries. Each mill will have to make its own investigation, and determine from the data obtained whether it would not be economical for that particular mill to purchase other fuel, and to utilize megass more profitably in other directions.

As regards the use of megass fibre for paper making, it is stated that Government investigators in the Philippines, in India, Java, and Japan have been making experiments with various vegetable fibres which might be found useful in the manufacture of a high class paper. The enormous increase in the consumption of paper has made it possible for manufacturing into paper vegetable fibres which a few years ago could not have been thus profitably employed.

It is suggested in the article referred to above that a paper mill might be added to, and made an integral part of the sugar factory itself. It may be remembered that attention was drawn to the erection of a paper mill in connexion with the Olaa sugar factory, Hawaii, in a previous issue of the *Agricultural News*. This mill however is for the purpose of producing from megass the special paper required as a mulch for cane fields.

With regard to the general question of adding a paper mill to a sugar factory, the following considerations are worth attention. In the first place, paper can be manufactured all the year round, thereby enabling the factory to give work to its employees all the time, and thus pay them better salaries. Instead of conveying the megass directly to the furnaces it might be sent into the big digesters in which it is later on to be dissolved, or it may be stacked in piles until the grinding season is over, and the manufacture of paper begun as a new and separate operation. Whichever of these plans is adopted it will be found that the grinding of the cane in the mill and the shredding of the stalks is the very best possible preparation of the fibre for paper making.

Whenever vegetable materials are used for the manufacture of paper the fibre must first be broken up; wood, for instance, when used for paper making must be ground fine, an operation evolving an immense amount of power. This great expenditure of power is saved in making paper from megass, because the cane is shredded as finely as necessary by the crushers and shredders in the course of sugar making.

When the megass comes from the last roller of the mill it still contains a certain amount of sucrose, and it also contains a large amount of pith and other soluble solids, which must be eliminated from it before it can be turned into paper. This operation is accomplished in a digester, in which the megass is boiled with water under a steam pressure of about 50 to 60 lb. The liquid obtained contains all the soluble solids of the cane, and when concentrated and mixed with fodder is said to form an excellent cattle food, while unconcentrated it may be poured out on the land as a good liquid manure.

The fibre remaining in the digester after the liquid has been drawn off is then boiled with a strong solution of caustic soda. By this process all the resins and pith, which are so troublesome in the manufacture of paper from resinous wood, have been eliminated, and there remains practically nothing but cellulose, which is then bleached by sulphitation.

There does not seem any reason why some of the big sugar mills should not operate for five or six months in grinding cane for sugar, and for the remaining six or seven months of the year in making paper from the megass. There is a ready market for all the white paper which the sugar factories of the West Indian islands could furnish, and seeing that the present price of paper is as high as $75 per ton for medium grade, it might prove an excellent investment to take megass worth anything from $1·50 to $3 per ton, and turn it into paper worth $75 per ton, even having to buy soft coal or fuel oil to take the place of megass. Perhaps, however, a still better plan would be to establish a very big paper mill in a cane district to take all the megass that can be collected, and to mix it with all the banana stalks which could also be gathered in the same district, and produce the high grade white paper, samples of which were exhibited at the Panama-Pacific International Exposition

PAPAWS.

The selection of types of papaws suitable for cultivation in Montserrat as a source of papain, referred to in last year's report, has been followed up, and seven selected types now occupy the breeding plot. The seeds of some of these have been available for distribution to persons interested in the cultivation.

To decide satisfactorily on the relative value of the various types for the purpose named, would require a much larger area of land than can at present be set apart for this work in the Experiment Station, and especial difficulties attach to the problem of testing one variety against another, where quantitative results for milk yield would be necessary, with further details on the question of the amount of papain obtainable from a given quantity of 'wet' milk.

One of the objects aimed at in the selection work was to decide if the progeny of a particular parent [illegible] the mother plant in essential characters, and the results of the work so far show that, generally speaking, this is the case.

Another important point in connexion with papaw selection is a variety that throws a large proportion of females in its progeny, but this would require breeding experiments on a much larger scale than can be at present attempted. (*Report on the Botanic Station, Montserrat*, 1917-18.)

PLANT DISEASES.

INVESTIGATION OF THE FROGHOPPER PEST AND DISEASE OF SUGAR-CANE.*

(*Continued.*)

THE RÔLE OF THE FROGHOPPER.

'So far the discussion has proceeded with only casual references to the insect whose prevalence is regarded by many as the beginning and end of the matter. Into the entomological aspect of the case it is not my part to enter, nor, as I have explained, was I a witness of the active operations of the pest. The remarks which follow have reference to the opinions which I formed as to its probable share in the production of the conditions of blight as it was visible in December and January

Approaching the subject of froghopper injury with an open mind, I became persuaded from consideration of the evidence that an infestation of froghoppers is capable, in some instances, of quickly producing severe effects, marked by the drying-up of the leaves, on even healthy and vigorous canes growing in rich and well-tilled soil. The history of two cases brought to my notice in districts widely separated had considerable weight in bringing me to this conclusion. Both fields had been attacked and severely damaged as plant canes. The one field had since given, without further attention, two good crops of ratoons and was still, as I saw it, in satisfactory condition. The other field was attacked in 1917, after three years of fallow and the use of pen manure and sulphate of ammonia. The soil is black and deep, and part of the field is a rich and well-drained bottom The ratoon crop on it was this year exceedingly vigorous.

'The instances specified illustrate the capabilities of the insect for harm with a clearness which is lacking from the ordinary run of cases which occur on ratoon crops, in which the condition of the canes is usually complicated by root disease, and often by cultural disabilities.

'It is important to note that in these cases, where other conditions were good, recovery seems to have begun as soon as the infestation was over, and no persistent after-effects were experienced.

'It is, I think, admitted that the effects of the pest are not commonly apparent on plant canes or on canes growing under conditions entirely favourable, and I was led to infer, from the above cases on plants, and from the healthy, though delayed, condition of several fields of ratoons which had been infested, that under these circumstances definite recovery, save in the matter of time, is likely to ensue From this one must conclude that froghopper infestation is not capable, without the co-operation of other adverse circumstances, of producing the permanently disabled condition which existed on many areas at the time of my visit, and which obviously constitutes the really serious feature of the situation.

'The facts as to the distribution of blight afford strong support to this conclusion. There are favoured estates on which no injury of the kind has ever been experienced. There are many others with land of unequal quality or unequally treated in which the trouble, when it has appeared, has always been confined to the poorer fields. The estates on which the trouble is most widespread and frequently recurrent are, in several cases if not in all, subject to disabilities, arising from their situation or from their history, which are perfectly well known to those concerned.

'There are instances which cannot be included with these, where the trouble has arisen unexpectedly on land as good and as well treated as is commonly found necessary to ensure satisfactory crops. Some of these, I am persuaded, could be accounted for by an intimate study of the conditions prevailing at the time; there are a few, it must be frankly said, in which even the possibility of an explanation on these lines was not evident, at least to a visitor. In a general survey such instances are very far from prominent.

'The simplest explanation of the severity of froghopper injury on fields affected by adverse conditions is that plants lacking full vigour, with an ill developed root system, are much less able to withstand the drain upon their sap which the feeding of the insects involves. This might account for the general drying up of leaves, which is the first effect of an infestation: I do not see how it can by itself account in the case of a plant with the powers of recovery characteristic of sugar-cane, for the continuation of the condition after the infestation has been subsided. Nor can anything short of a mass infestation be admitted to be capable of even this effect. The exponents of the froghopper have yet to show how the sucking of the comparatively small numbers of insects sometimes held responsible can effect so hardy a plant, apart from a toxic influence of which no evidence has been produced.

'The first effect of any adverse condition, it has been shown, is to afford an opportunity for the development of root disease; the methods of Trinidad agriculture, it has been further shown, ensure the presence of sufficient root fungus in the fields to take advantage of the opportunity. When a field attacked by froghopper is already in some degree infested with root disease, or when it becomes so infested in consequence of the effects of froghopper attack (as these effects are developed when conditions are already dubious), the permanence of the result is adequately accounted for. Such fields will pass into the condition of blight as I saw it.

'This conclusion does not carry with it the assumption that all blight is caused in the same way. The final condition is one of infestation with root disease, and a condition as severe as any existing in Trinidad can and does occur where froghoppers are unknown. In the production of many of the examples I saw, and especially of those in which the damage was most intense, there was no necessity to assume that the insect had taken any effective part.

REMEDIAL MEASURES.

'There remain for consideration the nature and application of the agricultural practices which, according to the view of the situation put forward will serve to reduce the injury directly caused by froghopper, and prevent the infestation of fields with root disease. No general prescription can be offered. Each estate and each varying section of an estate, will need to be considered separately, and modifications in prevailing practice be made to the extent which consideration and experience show to be necessary in each case. The manager of the estate, if he studies his fields, is commonly in the best position to decide concerning these, and where more critical comparisons are necessary they can only be supplied by experiments conducted under scientific control.

SANITATION.

'As regards methods of cropping the possible variations may be arranged in an ascending scale, beginning from the system of continuous cropping previously described. The departures from this may be regarded in the character of sanitary measures, the object of which is to rid the fields, to the degree found necessary, of vegetable material in the soil

* Reproduced from Mr. W. Nowell's Report on his work in Trinidad.

which carries on the existence of root fungus. This end is attained in the breaking down of such material and its assimilation by the soil

'The first and simplest of these measures comes within the period between the reaping of one crop and the planting of the next, and consists in thorough preparation of the ground. Early ploughing out of the stools and the subsequent working of the land, so that they are broken up and rotted, will usually suffice for their disposition. Where circumstances do not allow of this being done in time, they may be collected and rotted down in heaps. Burning I do not advise because of the loss of organic matter entailed.

'There is a good deal of land, which it will be understood is that which approaches the best in quality, on which thorough treatment of this kind combined with adequate manuring and cultivation may be expected to supply the necessary margin of safety, and I am inclined to think that this should be regarded as the minimum for even the best. It is not sufficient to consider whether such treatment is needed in favourable years, but whether its regular adoption is worth while as an insurance against unfavourable ones.

'*Rotation.*—Under less satisfactory circumstances of climate, soil, or soil condition—and this will apply to most of the land now subject to blight—it is necessary to go further, and clean up the land thoroughly by leaving out a cane crop, bringing it back into cane by either Spring or Autumn planting, according to convenience, in the year following that in which it was reaped, and cultivating it meanwhile in some alternative crop. From the point of view of sanitation from which the subject is at present being considered, the best crop is the one that involves the most cultivation, for which reason root crops are to be preferred The choice of rotation crops will be further discussed in another section.

'The frequency of alternation is again a question of conditions, and is involved with that of the duration of the ratoon crops. The choice is open among all the gradations between a practice of clearing up the land at long intervals (which is done at present in an imperfect and primitive fashion, by throwing out fields when they will no longer bear), and one of interposing a rotation crop at the end of the longer or shorter succession of ratoons which follows each replanting.

'*Ratooning periods*—In some cases it may be found sufficient (again with thorough preparation and manuring) merely to reduce the number of ratoon crops, without rotation, the extreme of this policy being the growing of plant canes only. The last-named measure is worthy of consideration where it is desired quickly to restore a run-down soil

'In judging the results of any of these measures there should be taken into consideration, on the credit side, the value of the improvement in the soil, and that of the insurance against blight secured. These values increase step by step with the thoroughness of the policy adopted; in the system of growing only plant canes, for example, the protection against blight is almost complete.

'*The Choice of planting material.*—It is highly desirable that the material used in planting should be free from contamination with root fungus, which means that it certainly should not be taken from a field noticeably infested. If cuttings are free from sprouted roots, and top plants have no fungus actually between the leaf-sheaths (cane wax must not be mistaken for fungus) they are presumably satisfactory in this respect.

'Some of the popular ideas on this subject of selecting cane plants are based on mistaken analogies with selection applied to reproduction by actual seed. It involves a biological fallacy to suppose that cuttings from vigorous plant canes will give anything in the nature of an improved strain as compared with cuttings taken from the scrubbiest ratoons, provided that both are of the same variety. What may perhaps be obtained in this way is a better start for the young plants, and a more certain freedom from actual contamination with root fungus. But provided the canes are clean in the latter respect, I know of no established reason why plant canes should be better for the purpose than ratoons. In a well-tilled "seed-bed" the young plants when once started seem but little dependent on the support of the cutting, and I think very much better of the prospects of a thin plant under these circumstances than of a fat one in a hard or lumpy soil.

'In good soil, under continuously favourable conditions, fine crops have many times been reaped from plants taken, owing to motives of economy, from the worst fields on an estate. But, since continuously favourable conditions can never be counted on, such a policy, so far as it involves the danger of carrying over root fungus, is not one to be recommended

'The soaking of the sets in Bordeaux mixture, which was originally recommended as a precaution against the pine-apple disease of cuttings, is of very doubtful efficacy against the mycelium of root fungus, in fact, as regards top plants, it may without hesitation be set down as useless in this respect.'

(*To be continued.*)

VELVET BEANS FOR STOCK FOOD.

The planting of velvet beans (*Stizolobium* spp.) as a green dressing is now known to be very advantageous in these West Indian islands. *Farmers' Bulletin* No. 962, of the United States Department of Agriculture deals with the cultivation and use of these beans. It is stated that the velvet bean is the best annual legume crop grown in the South for soil improvement as a green dressing. Furthermore the beans make an excellent feed for cattle and hogs. Feeding experiments show that from 2 to 2½ lb. of velvet bean in the pod are equal to 1 lb. of high grade cotton-seed meal.

Experiments made in feeding the beans to cattle at the Tennessee Experiment Station show that velvet bean meal mixed with an equal amount of cotton seed-meal at first was eaten by cattle with relish. Later on it was readily consumed alone as the entire grain ration. In no case, however, was it fed in greater amounts than 10 lb. per head per day.

In feeding velvet beans to dairy cattle at the Florida Experiment Station, it was found that milk was produced by feeding velvet beans in the pod at 13·3c. per gallon as compared with 13·7c. per gallon when cotton-seed meal was fed. In a second experiment with wheat bran used as a supplementary feed, the cost of producing a gallon of milk on the velvet bean ration was 12·7c., and with a cotton-seed meal ration 15·6c.

At the Tennessee Station it was found that velvet bean meal (pods and beans) could not well make up more than one-third the ration fed to hogs. By itself it was unpalatable to them.

At the South Carolina Experiment Station it was found that pigs on a ration of two-thirds velvet bean meal and one-third corn meal made a gain during the experiment of nearly 1 lb. daily, at a consumption of about 4½ of the ration per lb. of gain, and at a cost of about 9c per lb.

MARKET REPORTS.

Lex Oil.—The West India Committee Circular, May 29.

Balata—Venezuelan Block, no quotations; Sheet, no quotations.
Beeswax—No quotations.
Cacao—Trinidad, 119/6 to 121/-; Grenada, 118/- to 120/6.
Copra—No quotations.
Honey—Jamaica, 75*s.* to 90*s.*
Lime Juice—Raw, No quotations; Concentrated, no quotations.
Pimento—5¼*d.*
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, March 24, 1919.

Bay Oil—Lower, at 13*s.* to 14*s.*
Lime Oil—Slow, at 4*s.* 9*d.* for West Indian distilled, and 13*s.* for hand-pressed.
Orange Oil—West Indian, 7*s.* 6*d.* per lb.

Barbados.—Messrs. T. S. Garraway & Co., June 10.

Arrowroot—$8·60 per 100 lb.
Cacao—$19·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—$4·50 per 100 lb.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—White Crystals—$7·75.

Trinidad.—Messrs. Gordon, Grant & Co., June 4.

Cacao—Venezuelan, $26·50; Trinidad, $25·00.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 20c. per lb..
Copra—$9·00 per 100 lb.
Dhal—$10·50.
Onions—$9·00 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $5·00 per 100 lb
Rice—Yellow, $12·00; to $13·00 White, $9·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., May 27.

Cacao—Caracas, 25½c.; Grenada, 23c. to 23½c.; Trinidad, 24½c. to 25c.; Jamaica, 18c.
Coco-nuts—Jamaica selects, $58·00: Trinidad culls, $40·00 per M. $58·00
Coffee—Jamaica, 20c. to 23c. per lb.
Ginger—15¾c. to 17½c. per lb.
Goat Skins—Jamaica $1·23; Antigua and Barbados, $1·00 St. Thomas and St. Kitts, $1·05.
Grape Fruit—Jamaica, $5·00. to $6·50
Limes—Nominal $8·00 to $10·00.
Mace—39c. to 40c. per lb.
Nutmegs—18c. to 18½c.
Oranges—$4·50 to $6·50.
Pimento—9½c. per lb.
Sugar—Centrifugals, 96°, 6·90c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

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CONTENTS.

	PAGE.
Agriculture in Barbados	212
Avocado, Another Species of	219
Coco-nut Fibre Factories	214
Cotton Seed By-Products	214
Farm Schools in Cuba ...	219
Food Production, War-Time, in St. Lucia ...	313
Food Requirements of Man	216
Foods, Value of certain	216
Gleanings	220
Grenada, Agricultural Instruction in	223
Insect Notes :—	
Sugar-cane and Hard-back Grubs in Antigua	218
Items of Local Interest	212
Land Settlement for Demobilized Officers in the West Indies ...	209
Liming of Soils, The ...	217
Market Reports	224
Montserrat, Agricultural Outlook in	22?
Notes and Comments ...	216
Oranges, Shedding of ...	215
Plant Diseases:—	
Investigation of the Froghopper Pest and Disease of Sugar-cane	222
Rice, West Indian ...	217
Settlers, Assisted, in South Africa	210
Sugar Industry :—	
Palm Sugar Production in Madras	211
Sugar Cultivation in Germany	211
Vitamines	212
Water-cress	216
Water Power	217
West Indian Products ...	223

Land Settlement for Demobilized Officers in the West Indies.

THERE is a large number of young British officers with moderate amounts of capital who would gladly take up tropical planting if facilities were available to help them. Many of these men have little or no knowledge of agriculture, just as they had little or no knowledge of warfare before they went to the front. Most of them were in business of some kind, generally of a kind that fails to be attractive after long and hard military service. Are there any prospects for these people in the West Indies?

Their scanty qualifications for agricultural work is to some extent a handicap. But there is one important fact to bear in mind: the war has taught them resource and adaptability. Moreover, we are not discussing agricultural work in England. We are talking about tropical planting, which, as everyone knows, is much simpler than farming in England or America. Any man with business acumen and some knowledge of local conditions can soon learn to manage a West Indian estate, particularly cacao, limes or coco-nuts. The difficulty of inexperience, moreover, is considerably lessened by the expert advice that is available from agricultural officers in these islands. In fact, learning the work of an estate is only a minor matter compared with other things.

The intending planter must have capital. The majority of those who are keenest have only moderate amounts at their disposal — amounts ludicrously small when we consider the present day value of sugar and some other kinds of estates in the West Indies. But there is no reason why, in certain places, a young man with £500 to £1,000 should not begin planting, on a small scale, certain permanent crops like limes, coco-nuts or cacao, if he can support himself for the first three or four years without drawing for this purpose on his capital.

One way of doing this is to obtain a position of some kind or other on an estate, or in a business house, and to be content with a small salary, provided some facility is given for finding suitable land, and superintending in a general way its clearance and planting. The knowledge of local business methods obtained in this way would be most valuable

A position of that kind, however, is not easy to obtain, especially by a stranger. The other

alternative is for the State to assist these would-be planters.

There has been during the war, both in England and France, in fact throughout all territories directly affected by the war, a huge housing organization in the form of the Young Men's Christian Association. The Governments of certain tropical colonies might well imitate this system and erect accommodation huts for the reception of immigrant capitalists. Such accommodation, attached to the agricultural and experiment stations, would serve excellently the two purposes of cheap living and instruction—the two things the moderate capitalist from abroad requires. It must be clearly understood that a means of living cheaply is required, similar to what has been possible in the services during the war—something less than half a dollar a day. This would only be possible with a mess consisting of a considerable number of men. As a corollary, cheap or free steamship passages would be required.

These suggestions must be regarded in the light of post-war measures. They involve an element of generosity. Colonial Governments have not fared so badly during the war that this would be out of the question.

Another important matter is the possession of suitable land. This means not merely fertile land, but land that has proper communication with the coast. If road construction is out of the question, or what is equally important, if there are insuperable labour difficulties, then it would be unprincipled to attract the young capitalist. The experiences of some British planters in Dominica have caused to some extent West Indian colonization to fall into disrepute. Care must be taken in future to secure for those who decide to settle, the necessary means of conveying the estate produce down to the coast for shipment.

Before concluding this article, we may draw attention to an admirable system of colonization adopted in Rhodesia, by the Rhodesia Company. This company has large land concessions, and a part of this land is under cultivation. Young capitalists are got out from England. They are given jobs on one or other of the estates, paid a small salary, and are housed. At the end of a year or two years, if they prove their capabilities, they are provided with land in which they invest their capital, and hence begin in the best possible way to ensure success.

This system has attracted many demobilized officers, but there are still many more who await similar opportunities for taking up planting in the tropics or subtropics. The life is well suited for partially disabled officers—those who suffer from physical disabilities would find less manual work necessary than in England or America. On many estates riding is necessary, but the advent of the motor car has greatly reduced dependence on the horse as a general means of transport. For disabled men who suffer from lung trouble or nervous disorder, nothing could be better than living continuously in the open air in a warm climate. Moreover, West Indian life is cheerful, and offers amusements and recreations at a cost far below that in northern countries.

It remains for authorities in the different West Indian colonies to consider what they can do. Commitees should be appointed, and these committees should come to an early decision and communicate through the necessary channels with the War Office.

NOTE: Since the above article was written it has been learnt that the British Government has adopted a scheme to complete, at public expense, the agricultural training of a limited number of officers and men of equal standing, at colleges or farms situated in the Dominions and Colonies. A small proportion may be sent to the West Indies and receive instruction at one or other of the Agricultural Departments. It is proposed to allow these men £120 a year for two years, and as far as it goes, the scheme is a good move in the right direction. The scheme is limited, however, to not more than 300 men, and these for settlement in all parts of the Empire that afford opportunities. The scheme, furthermore, appears to cater only for those who have already received an agricultural education. There is still a large surplus of the class referred to in our editorial. Unless this Government scheme is extended, or action taken as indicated in our editorial, a large number of men will be denied an occupation in life that appeals to them.

ASSISTED SETTLERS IN SOUTH AFRICA.

In connexion with the editorial in this issue, the following extract from an article in a recent issue of *The Field* will be found very interesting reading :—

Free grants of land are not made in South Africa as in Canada, but the Union Government renders monetary and educational assistance to settlers, and has irrigable settlements in various stages of preparation . . . The Government has successfully developed small holdings in the Transvaal of about 200 acres each, the crops growing being teff grass, mealies and potatoes. It also offers farms in the Northern Transvaal suitable for stock-breeding, and (more particularly in the Rustenburg District) some promising experiments with cotton have been made. Much of the land is far from railways, but the prices are low, about 1*s.* 3*d.* to 3*s.* 9*d.* per acre. Holdings on the fringe of the Kalahari have been taken up at prices varying from 9*d.* to 1*s.* 6*d.* per acre. These low values indicate certain drawbacks, such as distance from town or rail, poor feed, and scarcity of water. Obviously the settler must make the fullest inquiries. It is quite probable that there will be big railway developments before very long—a prospect to be watched. Sugar-cane growing in Zululand has been successful, and the Government hopes to be able to throw open for allotment more land for that purpose. From time to time farms are acquired by Government in various parts

of the Union to be sold or let to settlers. Of several private schemes to provide land for closer settlement, that of the Sundays River (irrigated) is probably the most important. It is 21 miles from Port Elizabeth. In Swaziland Lord Lovat is arranging for the settlement of 100 Scottish soldiers on his estates. The terms are more than liberal. . . .

I would call particular attention to the fact that the Union Minister of Lands has power to purchase *private* land on behalf of a settler, who has to provide one-fifth of the purchase price. This power has been exercised with encouraging results. The usual limit of advance is about £1,200. The settler pays his fifth, then nothing for two years, after which he must repay the capital (*plus* 4 per cent.) in twenty annual instalments. There is also a Government Land Bank which makes advances to purchasers of farms against the value of improvements, and even farm tenants can obtain small advances. Applicants for land must, however, satisfy the authorities that they have sufficient capital, suitable qualifications, and intend to work the land themselves. In the case of leases of Government land, the settler retains an option of purchase, and his rent is based on a valuation of the land. He pays no rent the first year, 2 per cent. of the valuation the second and third years, and 3½ per cent. during the fourth and fifth years. If the option of purchase is ever exercised, the capital payments with 4 per cent. interest are, in the case of Government land, spread over forty years. Of course the settler should obtain from the authorities full details of the regulations. Address inquiries to the Department of Lands, Pretoria.

As to the educational advantages, there are public schools of agriculture at Elseburg near Capetown; Cedara, Natal; Grootfontein, Middelburg, Cape Province; and Potchefstroom, Transvaal. The school fees, including board, are only £50 a year, which is far below the cost involved. For working farmers, including women, there are short courses lasting about a month, with a break of a few days in the middle. About £5 to £6 covers the student's entire expenditure. Mr. Smith, the Secretary for Agriculture, informs me that he is strongly of the opinion that men intending to farm in South Africa should, if possible, spend a year or two with a good farmer, or preferably at one of the Schools of Agriculture. 'One or two years,' writes Mr. Smith, 'may seem a long time to spend for an apprenticeship, but I am sure in the long run it will be time and money saved. Of course the more a man knows about farming in other countries, the better, but no matter how much he may know, he will have much to learn when he comes here.'

Palm Sugar Production in Madras.—The number of palm trees which are usually tapped for palm sugar in the Madras Presidency is estimated by the Department of Agriculture as 2,500,000, and the yield of jaggery (crude sugar) therefrom as 35 000 tons (of 2,240 lb.). The total palm-sugar production of India, writes the United States Consul at Madras, is stated to be about 300,000 tons, of which Bengal produces about 100,000 tons, valued at £480,000. India's total production of sugar, both from cane and palms, is somewhere about 3,000,000 tons per annum. The area under sugar-cane in Madras is less than 4 per cent. of the total area in British India, the United Provinces being the great producing area. (*Journal of the Royal Society of Arts.*)

SUGAR CULTIVATION IN GERMANY.

Dr. H. C. Prinsen Geerligs writes as follows to the *Louisiana Planter* with regard to the position of sugar cultivation in Germany—a subject of considerable interest to all sugar-producing communities :—

'The opinions of the leading sugar men in Germany as to the probable extension of sowings for the next sugar crop in that country are most pessimistic. The Saxonian-Thuringian Branch of the Association for the German Sugar Industry moved on February 12, that unless within a fortnight a decent maximum price for beet roots was fixed, the German beet cultivation for the 1919-20 crop would undergo a considerable reduction. This fortnight has already passed and no price has as yet been stipulated, either for beets or for sugar, which will certainly lead to a small beet sugar crop in that formerly large producing country.

'The Association for the Promotion of Sugar Cultivation in Germany adopted the following wishes :—

'1.—It is urgently necessary to regulate the labour conditions in such a way that full attention will be paid to beet cultivation. The high cost support for unemployed workmen should cease, and a compulsion to work should be established instead. The wages ought, as much as possible, to be paid in kind and as shares in the profits. A good supply of skilled, foreign female labour should be established.

'2.—The price of beets should be elevated to 40 marks per 50 kilos, and this increase should be published as soon as feasible in order to enable the farmer to plough deep in proper time for the beet cultivation, since only a deep-ploughed land will be able to bear a sufficiently high beet crop.

'3.—The conservation of dung and manure should be conducted on a rational basis, and extensive use should be made of the establishments where nitrogen from the atmosphere is fixed. The lacking phosphoric acid should be imported from overseas to ensure a full supply of artificial fertilizers

'4.—The farmers are to be allowed to supply beets to their former buyers.

'5.—The delivery of sugar to labourers should be increased, especially during harvest time. The allowance of 600 kilos of sugar for every 1,000 tons of beets supplied should be raised to 1,000 kilos.

'6.—The pulp and molasses from the beets are to be sold to the growers.

'7.—The supply of coal to the factories should be regulated in a rational way.

'These demands are being published repeatedly, and if the German Government had acted according to them, a large area of land would have been prepared now for beet cultivation, which in this moment cannot be used for that crop, and perhaps will not be fit for it this year.'

In a note on chlorosis of sugar-cane, the *Experiment Station Record* for January 1919, reports that this trouble can be prevented to some extent by the application of stable manure containing ferrous sulphate, and stable manure alone, although large applications did not overcome the chlorosis completely.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Mr. J. C. Moore, Superintendent of Agriculture, writes to say that experimental work on the red ring disease of coco-nuts has been continued at Westerhall. Work in the Botanic Gardens has consisted in the planting of yams, tanias, cassava, sweet potatoes, and beans. Trial plots of onions have been planted. Observations relating to the condition of the staple crops indicate that cacao, limes, nutmegs and canes are all in normal state. During May the young fruit on lime-trees was developing well, and cacao was flowering. During the month the Superintendent of Agriculture gave an illustrated lecture on the red ring disease of coco-nuts. The Superintendent has been appointed by the Board of Primary Education as examiner for 1919 in agriculture (Nature Teaching) of certain candidates for school teachers' certificates. The plant distribution during May was as follows: yams, 1,124 lb.; cassava, 375 cuttings; onions, 1,100; oranges (budded), 21; grape fruit, 3; mangoes (grafted), 28; cane plants, 14,500 (imported); eddoes, 535lb.; grapes, 2; ornamentals, 16. Seed distribution consisted of coco-nuts, 4,494 (imported); red kidney bean, 17lb.; onion, 10 oz. Rainfall for the month at Richmond Hill was 5·92 inches.

NEVIS. Mr. W. I. Howell informs us that in the Experiment Station crops have made very little progress during May, on account of dry weather. On the estates the cane crop is suffering from a similar cause. Supplying is still in progress, and many of the fields are not yet established. Reaping of the old crop in some places, is still in progress. Regarding cotton, the young crop is having a hard time on account of the dry weather. Many places have not yet been planted. The planters are stated to be very concerned over the situation. Special work has consisted in the visiting of plantations in the different parts of the island, and in the purchasing of cotton for the War Office. The total quantity of cotton purchased to date is 728 bales weighing 241,723 lb. net, which is practically the season's crop. A meeting of the Agricultural and Commercial Society was held during the month at which the questions of old cotton and the native food-plants of the cotton stainer were discussed. Rainfall for the month of May, 1·97 inches; rainfall for the year to date, 9·47 inches.

BARBUDA. Mr. Jarvis, Government Manager of the island, writing on June 11, states that little attention was given during May to cotton cultivation, owing to the wreck of a ship which the labouring population were salving. Regarding live stock, the animals were in excellent condition. This is attributed to the recently adopted practice of keeping all the stock in enclosures. Concerning agricultural instruction, peasants have started to make new grounds. They have been ordered during the month to have all the old cotton plants destroyed by the end of it, and to plant afresh when weather permitted. Concerning work contemplated, reference is made to the preparation of land for cotton. It is hoped to have as much land prepared as to plant at least 100 acres.

AGRICULTURE IN BARBADOS.

The present month (June) is the seventh of extremely dry weather in the island. The winds have continued very high, and the appearance of the sky has been such as is observed during the middle of a very favourable reaping season. These observations are taken from the *Barbados Agricultural Reporter* for June 28, 1919. At the time of writing the present article (July 1, 1919) the weather has shown some indication of a change in character. Thunderstorms have occurred in the neighbourhood of the colony, and it is hoped that there will be prospects at an early date of fairly regular rain.

On the estates the old cane crop has been entirely reaped. Regarding the average tonnage, it appears that the average yield of 32 for plant canes fell to 22½ as soon as the first ratoons were reaped. It is believed that the average for the whole crop will be about 20 tons. The *Reporter* states that on one of the estates in the colony only first ratoons will be grown in future. This is regarded as a step in the right direction, but it is asked whether it would not be better to fifth the average acreage, grow second ratoons, and go in for a system of resting the soil. It would be interesting to know which system would produce the best result.

The shortage in the output of the factories is likely to cause a scarcity of sugar for local purposes, and the Government have wisely issued a notice calling for a return of sugar in stock, whether in the hands of merchants, shopkeepers or planters. The retail prices of the various grades of sugar have also been limited by Proclamation.

The prospects of sugar for the next few years are believed to be good. The consumption will increase with the removal of all food restrictions, and there is now the preferential treatment which will be accorded to British grown sugar by Great Britain on September 18, 1919. Writers on the sugar question say that it is Cuba which the British producer will have to reckon with. As already noted in the *Agricultural News*, Cuba has increased its output by leaps and bounds, until now its crop yield is close on 4,000,000 tons. This huge total has been reached by an annual extension of cultivation, and by improvements in manufacture. Although preferential treatment will place British producers on a favoured footing, it is absolutely essential that they, too, should introduce every improvement in manufacture, and pay the utmost attention to the scientific treatment of the soil. The *Reporter* says that in Barbados there should be no halting until the colony is able to produce a ton of dark crystals from an average of not more than 7½ tons of canes.

VITAMINES.

Dr. Leonard Hill, F.R.S., gives some interesting information on these remarkable substances in a paper read recently before the Royal Society of Arts, and published in the Journal of that Society (May 9, 1919). Lime and lemon juices contain important vitamines: hence their value against scurvy during an unvaried diet at sea. Recent work tends to show that lemon juice is a specific for pellagra as well as for scurvy. (See *Physiological Abstracts*, April 1919, p. 30.) Dr. Hill's article runs as follows:—

Recent research has drawn an ever-increasing attention to the accessory dietetic factor—the so-called vitamines. We are adjusted to live on fresh, natural foods, plant and animal tissues (not millers' separated products), and these contain countless substances other than proteins, carbohydrates, and fats (Gowland Hopkins). Rickets, scurvy, beriberi, pellagra, and many unrecognized pathological conditions are produced by lack of one or other of these substances,

some of which are necessary for maintaining metabolism, and others for growth.

Vitamines are of two types: (1) water soluble, found in tissues which contain active cells, in the embryonic parts of plants, germ of cereals, yeast, milk, egg, glandular epithelium; (2) fat soluble, constituents of active cells, but not in store fat—e g. lard, nut-margarine; present in milk, cream, butter, egg yolk, cod liver oil, oil of other glandular tissue, edible green parts of plants.

Of the water soluble vitamines those which prevent scurvy are easily destroyed by cooking, those which prevent beri-beri not so.

If white rats are fed on pure milk protein, starch, sugar, fat, and the inorganic salts of milk, there soon results a lethargic condition, unsleek coat, cessation of growth, decline, and death. A few milligrammes of yeast or wheat-germ a day restore them to full health. If dogs are fed on peas-meal and cotton-seed oil, there result diarrhœa, dermatitis, delirium, and death—the symptoms of pellagra. Butter-fat cures them like magic. The British garrison in Kut, when rationed on white flour, suffered from beri-beri. The disease disappeared on their sharing in the coarse grain of the Indian soldiers.

Pellagra, prevalent in Turkish prisioners fed chiefly on maize, is cured by broadening the diet. Xeropthalmia, occurring in Scandinavian children fed on cereals and skimmed milk, is cured by the addition of cream of cod liver oil.

Puppies fed on a certain deficient amount of bread and milk get rickets. The addition of butter fat prevents this (E. Mellanby).

Scurvy resulting from a diet of over-cooked and preserved food is at once cured by the addition of fresh vegetables, raw or lightly boiled, orange juice, or the juice of turnips.

The milk of stall-fed cows is poor in vitamines. City mothers fed on vitamine food, yield milk poor in vitamine (E. Mellanby). When babies are fed on diluted cow's milk sweetened by sugar, the water soluble vitamines are brought low in amount. If the appetite fails, deficiency may result, and then endless dietetic troubles follow. It is not improbable that a large part of the difficulties of artificially feeding babies is due to this cause.

In addition to vitamines, experiments on the feeding of rats and chickens have shown that, for adequate growth, a suitable supply of certain amino-acids must be available in the diet. These are the building stones of the proteins, and proteins vary in their content of essential ones. A ration which fails to yield these in reasonable abundance cannot promote the synthesis of new protein, that is growth; but if the other (non-protein) dietary factors are suitable, increment of weight can promptly be brought by the addition of these essential amino-acids.

WAR-TIME FOOD PRODUCTION IN ST. LUCIA.

We have received from His Honour the Administrator, St. Lucia, an interesting and instructive report prepared by Mr. A. J. Brooks, Agricultural Superintendent in that colony, on the methods adopted to increase the production of foodstuffs during the war.

First of all, special appeals were made, by printed circulars and posters throughout the colony, to assist as far as possible in the matter of increased production among the peasants. Attention was also given to the planting of Government land. At Réunion, 25 acres were cleared of bush and planted with provision crops. This increased the local food supply, and also served as an object-lesson to the community. Available land at Government House was similarly planted. In the Choiseul District, free grants of land were made to thirty-four peasants for the duration of the war

As well as assistance in the above direction, the Government helped the peasants by means of the free distribution of potato and cassava cuttings, and seed maize.

One of the most important steps taken during the war was the extensive experiments in regard to the manufacture of flour and meal from such crops as sweet potatoes, dasheen, bananas, tanias and breadfruit The results obtained showed that wheat-flour shortage can be made good by using flour from sweet potatoes. This potato flour cannot be kept for more than six months in a fresh condition, but if the potatoes are carefully sliced and dried, the material can be kept for an indefinite period.

A collection of the various flours, meals, starches, etc. prepared from local food crops, was exhibited in the Public Library.

Concerning the threatened shortage of wheaten flour, regulations were passed enabling the Governor to regulate the sale of, or consumption of, wheaten flour, or of any other article of food. Fortunately at no period of the war was it necessary to bring this regulation into force, but had the necessity arisen, the Agricultural Department was in a position to supply the potato meal required.

Useful work was accomplished in connexion with a farine and starch factory. A small factory was erected at Réunion and equipped with mill, presses, drying trays and a battery of baking pans, for the manufacture of farine and starch on a commercial scale. Over 30,000 lb. of farine and starch have been made in this factory to date. This has given, therefore, much encouragement to the growers of cassava.

The production of corn and corn meal was increased by the free distribution of large quantities of seed purchased by the Government from St. Vincent. Grinding mills were obtained, and all surplus corn was purchased and turned into corn meal and sold to the general public.

Lastly, the report calls attention to the establishment of a Government Central Ground Provisions Depôt. The immediate object of this depôt is to ensure a constant supply of fresh provisions for the community throughout the year; the ultimate object is to improve the conditions of the peasant grower by securing for him a regular sale for his produce at fair prices. The total number of persons who made purchases at the depôt during the last twelve months was 48,095, this being just over 4,000 per month. It is noted in connexion with this, that the Public Market is situated only a short distance from the Government Depôt

Mr. Brooks's interesting report concludes with a statement of receipts and expenditure. The total advances for food production efforts were £350 This secured a revenue of £175. The assets at the time of writing were estimated at £190 The financial position in regard to these efforts appears to be as satisfactory as the economic benefits derived by the people.

The differences in the action of aperients on different parts of the bowel is the subject of an interesting note in *Physiological Abstracts* for April 1919. Some drugs act more powerfully on the duodenum and less on the colon, while the reverse action is observed with other drugs. Drugs which tend to strengthen the contraction of the colon include cascara and magnesium sulphate (Epsom salts). Drugs which act more upon the duodenum include digitalis, ergot, ipecacuanha, potassium permanganate, and sodium silicytate. It is suggested that drugs used as laxatives make the gradient of contraction more steep, and the emetics tend to reverse the gradient.

COTTON SEED BY-PRODUCTS.

On February 5, at the Royal Society of Arts, Mr. El. C. de Segundo read a very interesting and suggestive paper on 'The Removal of the Residual Fibres from Cotton Seed and their Value for Non-textile Purposes.' Mr. de Segundo explained that there are two main classes of cotton seed, viz. the bald, black, or clean seeds, such as Egyptian, Sea Island, Brazilian, etc., of which practically the whole 'lint' is removed by the process of 'ginning,' or separating the lint or textile fibre from the seed, and the white, woolly, or fuzzy seeds such as American, which are still covered with a short white 'fuzz' or lint after ginning. Indian cotton seed is really of the latter class, though the fuzz remaining on the seed is much shorter than in the case of the American.

To deal with these two classes of seed, two different methods have been adopted. The black seeds are crushed whole, and the residue, after extraction of the oil, is pressed into cattle-cake. The white seeds are first 'delinted,' which removes part of the short fuzz left on the seed after ginning, the machine used being practically the same as the saw-gin used for the ginning itself. The short fuzz or 'linters' thus removed is used for gun-cotton, blotting paper, waste, etc. The seed is then 'decorticated,' a process of separating the hull, with the fuzz still remaining on it, from the kernels or meats. The latter are then crushed alone, and the oil is taken out in a much purer form than is possible under the whole crushing process, because the presence of the hull or shell gives a darker colour to the oil. Incidentally, the process afterwards required to remove this dark colour gives the oil a slightly bitter taste, which made the value of such oils distinctly lower than those got by the decorticating process. The crushed kernels give a very fine residual product known as cotton seed meal, which has recently been attracting particular attention, because it has been shown to possess very high qualities as human food. Its protein and fat contents are very high, and mixed with potato, or wheat flour, it produces a most valuable form of food.

As it happens, the two processes above described have come to be known as the British and American processes, respectively, because the British crushers have only had the opportunity of handling the Egyptian and Indian cotton-seed products in large quantities. The bulk of the American crop has, naturally, always been handled in the States. The Indian crop, known as Bombay seed, has always been imported into this country [England] and crushed whole without previous delinting, because its seed-lint was scarcely long enough to be worth removing, and its presence in the cake (though it took long to convince the users of it that this was true) did no material harm if properly handled, while it gave a much bulkier, and therefore cheaper cake.

The two improvements with which Mr. de Segundo has been connected are, first, the production of a machine which, after ginning and delinting in the ordinary way, takes a further quantity of 'seed-lint' from the seed. This seed-lint is of considerable commercial value for many non-textile purposes, such as paper making, artificial silk, explosives, and cellulose acetate, the peculiarity of the process being the very clean and pure condition in which it delivers the lint. Its removal also adds to the value of the seed for crushing purposes, saves freight by reducing its bulk, and minimizes the danger of heating, and hence the risk of fire by spontaneous combustion. The second improvement is a process of removing the last vestige of fibre from the hulls after decortication, thus taking two further by products out of the last residue of the former process. It was the first of these improvements that was mainly dealt with in the lecture.

The importance of these processes to the cotton industry is certain to be very considerable. There are many new areas in the British Empire where cotton is being developed, such as Uganda, Nigeria, and parts of the Sudan, where the woolly-seeded varieties have been found the most suitable, but the seed has never been fully utilized because the crops were comparatively small, and the cost of handling them under the disadvantageous conditions found in these areas, was scarcely covered by the value of the by products. But by increasing the value of these by products the scale may be turned, and such a system rendered profitable, and it would certainly be an advantage to these areas to have such a supply of oil and cattle and other foods as these by-products would yield. Again, there are other areas where cotton is struggling against the rivalry of other competing crops, and where the scale might just be turned in its favour by the increased value of its by-products. Reference was made to the position of India, where the seed-crushing industry has never been properly developed, and it was agreed that such a process as the seed-lint removal might make all the difference.

A seed-lint defibrating machine was shown working at the lecture, and samples of all the by-products were exhibited including bread, scones, and cakes made with a proportion of cotton-seed flour. There was a very useful discussion after the lecture by a number of experts representing different sections of the trades affected. (*Nature.*)

COCO-NUT FIBRE FACTORIES.

At the beginning of the present year the Jamaica Imperial Association wrote to Sir Francis Watts, the Imperial Commissioner of Agriculture, for information regarding the erection of a coco-nut fibre factory in Jamaica, also in regard to a coco-nut oil factory. In due course it was found possible to procure valuable information on the subjects from Trinidad, through Mr. W. G. Freeman, B.Sc., acting Director of Agriculture, and through the kind offices of Messrs. Neil and Greig of that colony.

There are three coco-nut fibre factories in Trinidad, to which reference was made in a general way in the *Agricultural News* for May 31, 1919, at page 163. The total capacity of these three factories is 480 long tons. Regarding the method of manufacture, this is carried out in six processes. In the first process the husks are battened down in concrete tanks and soaked in clean water for about five days. The second process consists in passing the soaked husks through a crusher composed of a pair of cogged rollers pressed together by heavy springs. The third process concerns the matter of cleaning. The mills for this purpose consists of a rotating drum about 30 inches diameter, fitted on the periphery with steel spikes. In front of this drum there is a pair of small feed rollers through which the husk is fed and held against the rotating teeth. The husk is passed through these rollers as far as possible without letting go of it. It is then drawn back and turned end for end. After that it is turned over and the operation is repeated. The long staple fibre, generally known as 'brush fibre', remains in the operator's hands, and the short staple fibre, known as 'mattress fibre', is drawn into the machine. So far as the long staple fibre is concerned, it is now finished except for drying

In the fourth process, the mattress fibre containing all the refuse is taken from under the cleaning mills and put in the 'willowing' machine, which is an inclined revolving drum covered with ½-inch wire mesh, and containing

revolving beater drums mounted on a shaft which rotates in the opposite direction to the drum. In the fifth process, the fibre is spread out in the sun to dry, which in fair weather can be done in a day. Lastly, the fibre is hydraulically pressed into bales measuring 20 inches × 20 inches × 40 inches, which weigh about 180 lb.

Regarding the commercial prospects before the manufacture of coco-nut fibre, it is the opinion of Mr. Neil of Trinidad, that these are not promising, owing to the increased cost of manufacture, and the rapidly falling prices obtainable. The increased cost of manufacture is due to the high cost of fuel oil and excessive freight rates. It is stated that the cost of freight now amounts to one-third of the gross value of the fibre shipped. It is possible, in the case of Jamaica, that the cost of freight will not be so high an item of expenditure as it is in the case of Trinidad. At any rate, on the basis of the information available, the production of coco nut fibre in Trinidad is not regarded, under present conditions, as a very profitable undertaking.

For those readers of the *Agricultural News* who wish further information principally in connexion with the coco-nut as a source of fibre, and a description of the machines used to extract the fibre and the oil, the following references may be useful. Valuable information will be found in the Coco-nut number of the *Philippine Agricultural Review* for May 1912, and in a more recent one for the first quarter, 1918. Reference may also be made to the standard work on the coco-nut by Professor Copeland. It is interesting to learn from this book, for example, that certain varieties of the coco-nut are more valuable than others for the manufacture of fibre, and further, that there is a proper time for the harvesting of the crop for this purpose, before which, and after which, the coir is less in quantity and less valuable, weight for weight. What the time is can not be stated definitely, but it may be roughly said to be at the beginning of the ripening of the nut. It may be at the time when the nut as a whole is largest, or may be a little later than this, but is certainly considerably before the time when the nut should be harvested to get the greatest and best yield of copra.

Turning to the matter of coco-nut oil production, the Imperial Commissioner of Agriculture has called attention to the possibilities in this direction of the Anderson Oil Expeller. One of these machines is in successful operation in St. Vincent, for the manufacture of cotton-seed oil. An account of this machine and of its cost is contained in the *West Indian Bulletin* (Vol. XV, pp. 306-8). Sir Francis Watts has had a small preliminary trial made of this machine with coco-nut material, and the results appear promising.

In conclusion, the production of coco-nut fibre and oil is to be encouraged, even though at the present time labour, freights, and fuel may be temporarily inflated. Particularly in the case of fibre has there been a great deal of waste in the West Indies ever since the beginning of coco-nut culture on an organized scale.

THE SHEDDING OF ORANGES.

Although serious trouble in regard to the shedding of oranges does not appear to have been reported in the West Indies, the following account of abnormal shedding of the Washington Navel orange in California will prove interesting to local growers. It may be noted that abnormal shedding has been reported in the case of coco-nuts, and the flowers of some citrus trees in the West Indies. This, like the California trouble, is caused by a fungus intensified by conditions of environment :—

Citrus trees, as grown in the interior valleys of the arid south-west, are subject to an environment entirely abnormal to them in their natural habitat. Moreover, the principal variety grown in these regions, the Washington Navel orange, is itself decidedly erratic and unstable.

Among other troubles incident to the abnormal climatic conditions is that heavy dropping of the young fruits, with consequent light crops, known popularly as the June drop. A study of the shedding has established the fact that it constitutes true abscission, involving the separation of living cells along the plane of the middle lamellae. Exhaustive investigations as to the stimulus or stimuli responsible for the abscission have narrowed them down to two : a fungus, *Alternaria citri*, E. and P., and climatic conditions.

It is considered highly probable that a certain varying per cent. of the drop occurring relatively late in the season, is brought about by the stimulation of this fungus, which is also responsible for a black rot of those infected fruits which remain on the trees to maturity.

This fungus is of very wide distribution, and infection of the young fruits is made possible through the peculiar structure of the navel orange. The amount of infection is dependent upon weather conditions, and the more or less fortuitous configuration of the navel end of the young fruits.

On account of the peculiar manner of infection, and the relatively small amount of shedding due to the fungus, spraying will probably not pay for the labour and materials involved

By far the greater part of the shedding, which occurs earlier in the season, is due to a stimulus to abscission arising from daily water deficits in the young developing fruits, resulting from the asperity of the climatic complex to which the trees are subject.

The principal factor in causing these abnormal water deficits lies in the fact that citrus trees are not adapted to withstanding the heavy water loss incident to the desert conditions under which they are grown. The amplitude of stomatal movement is small, and cuticular transpiration very high. It is further believed that under the prevalent clean cultivation practised, the soil temperatures during a part of the day are so high as to result in the inhibition of absorption at the very time of day that water loss by transpiration is greatest.

It has been found possible to modify climatic conditions in an orchard so as to set crops in every way comparable with those produced in much more climatically favoured citrus districts.

Under these modified climatic conditions, the abnormal water relations referred to apparently do not occur.

Practical means of amelioration lie in heavier and more frequent irrigation, the planting of intercrops, mulching with straw and other materials, protection by means of wind-breaks, and a reduction of leaf area by moderate winter pruning. Measures of an anticipatory nature lie in the judicious selection of the site for the orchard, with reference to its exposure, nearness to large irrigated bodies of land, and other features calculated to ameliorate climatic conditions.

Orchardists should be on the lookout for mutant strains which are dry heat resistant, and satisfactory in other features. (University of California *Publications in Agricultural Science*, Vol. III, No. II, pp. 283-368.)

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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**Seconded for Military Service.*

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NOTES AND COMMENTS.

Contents of Present Issue

The editorial in this issue deals with a subject of land settlement for demobilized officers and men of equal standing in the West Indies.

An interesting article describing another species of avocado will be found on page 219.

Insect Notes in this issue deal with the sugar-cane and hardback grubs in Antigua.

Under Plant Diseases will be found the concluding portion of a report on the investigation of the froghopper pest and disease of sugar-cane.

Food Requirements of Man.

The Food (War) Committee of the Royal Society of London has recently issued a report on the food requirements of man, and their variations according to age, sex, size, and occupation. This report is reviewed in *Nature* for April 24, and several points of interest are brought out. The food requirements of a male have been found to vary from 2,750 calories for a tailor, to 5,500 for a wood-cutter. The influence of external temperature has not yet received adequate investigation, so that it is not possible to apply results for different seasons of the year, nor for different climates.

The energy requirements of women have been found to range from 1,783 calories for a seamstress, to 3,281 for a laundress, the food requirements of the average working woman being placed at 2,650 calories per diem. It may be explained that a calorie is the unit of heat, and means the amount of heat required to raise 1 cubic centimetre of water 1 degree in temperature.

Value of certain Foods.

A note on the dietetic value of certain foods appears in *Physiological Abstracts* for April 1919. In regard to the dasheen, it is stated that this vegetable contains 50 per cent. more protein and 50 per cent. more starch and sugars than the potato. Again, in regard to Sudan grass hay as a food for live stock, digestion experiments have shown that 64·9 per cent. of the dry matter is digestible. The analyses of the hay show that the fat and protein increase in the early stages of ripening and then decrease, while the changes in nitrogen-free extracts and ash are in the opposite direction. Lastly, there is a note of interest on sea-weed as fodder. It is stated that recent experiments in Norway, France and Germany show that certain sea-weeds may well be given to animals and leave no trace of smell in either meat or eggs of animals experimented on. It seems most advisable to give the sea-weed in the ground dry state as a supplementary food, especially to cattle and pigs, but its nutritive value must not be over-rated.

Water-cress.

The common water-cress (*Nasturtium officinale*) is one of the cosmopolitan plants cultivated as a salad plant. It grows readily in the West Indies, although it does not fruit here, but it is so easily propagated by small pieces of the stem that its cultivation presents no difficulty. In a note on the subject, Mr. W. N. Sands, the Agricultural Superintendent, St. Vincent, states that small stretches of water rills, cleared of weeds and drained at the outlet, are very easily stocked with cuttings of cress or small pieces of the stem with roots attached. They quickly take root, and in a short time the surface of the pool is covered with the shoots of the water-cress, which affords a perennial supply of succulent salad.

In the drier West Indian islands, where rivulets are not frequently be to seen, water-cress is grown in

the basins of artificial fountains or in tubs. In this latter case, earth to the depth of about 6 inches is placed in the tub, and the cuttings of cress planted in it. Water is then allowed to flow into the tub, covering the earth to the depth of 2 or 3 inches. There is a plugged outlet just above the surface of the soil, by which the water may be drawn off, say, every other day, and fresh water poured in. Very satisfactory crops of water-cress may be grown in this way.

Water Power.

An article in *Nature* commences with the following sentence: 'The prominence which has recently been given to the latent possibilities of power in streams, at present, from an industrial point of view, running to waste in the British Isles, has had the effect of stimulating public and professional interest to such a degree that reports and articles on the subject are now being published in close sequence, and we are appreciably increasing our knowledge of the conditions prevailing in appropriate regions, and of the measures which are desirable for exploiting such sources of power'.

It has frequently been advocated in this Journal that the water power in the mountainous West Indian islands should be exploited to a much greater extent than it is. In Dominica, it is true, many of the lime juice mills are driven by water power, and electricity is generated from water power at Roseau, and on a smaller scale, privately, at Basseterre in St. Kitts.

But in Dominica, St. Lucia, St. Kitts and Grenada, there is still a large amount of power running to waste. It has been suggested that nitrate of lime might be manufactured by means of water power in one of these islands. Plenty of lime is available in the Leeward Islands, and the only initial outlay would be the cost of the electric plant to fix the nitrogen from the atmosphere.

Another possible source of power in the volcanic West Indian islands is volcanic steam. In Italy steam is bored for, like oil, in the regions of volcanoes. Pipes are laid, and this power can be transmitted over considerable distances, although it is generally used on the spot for running machinery.

West Indian Rice.

The production of rice in British Guiana and in Trinidad has increased very greatly during the last ten years, to such an extent as to render unnecessary the old time practice of importing this grain from India and other places abroad. On a smaller scale rice cultivation has been encouraged in St. Lucia during the war. Leaflet No. 16 of the St. Lucia Agricultural Department, published a few months ago, gives instructions for the general growing of this crop. It is stated that the shortage of cereals has increased the area under this crop locally, and that something like 5,000 cwt of paddy are now produced annually in the colony. This is a very satisfactory state of affairs, and Mr. A. J. Brooks the Agricultural Superintendent, is to be congratulated upon his efforts to stimulate progress along this line of development.

In the case of sugar-cane cultivation, climatic factors do not limit areas of production to any great extent. For example, sugar-cane can be grown in a locality with a rainfall of 100 inches per annum, or in one which receives, say, not more than 30 inches, provided the proper varieties are selected for planting, and provided cultivation is carried out to meet the differences of rainfall. With rice, too, climatic differences can be met by growing the proper variety. In places where there is no swamp land, Upland rice is the kind to cultivate, and it is this variety which offers most prospect of extension in the West Indian islands.

With regard to the relation of climatic conditions to rice cultivation, reference may be made to a valuable paper in the *Philippine Agriculturist* for January 1919. In the Philippines it is found that grain yield is highest during the season of high evaporation, and lowest during the season of low evaporation. The period required for harvest varies in the variety experimented with (Inintiw) from 104 to 174 days. Other points brought out in this paper include the statement that the longer the panicle, the greater the yield; also, the taller the plant, the higher the yield. Good vegetative growth is there necessary for a good production of seed.

The Liming of Soils.

A study of the principal plantation soil types as found on the island of Hawaii is the subject of a report issued as *Bulletin No. 45* by the Experiment Station of the Hawaiian Sugar Planters' Association. In this report the statement is made that the lime requirements for the surface soils vary from 2,000 lb. to 22,000 lb. This is interesting, in connexion with the results of experiments on this point carried out in St. Kitts and Dominica. On the cacao experiment plots, estates, and forest lands of Dominica, the lime requirements were found to vary from 450 lb. to 23,700 lb. It is interesting to note, in these Dominica results, that the soil which required only 750 lb. was a plot which had grown cacao continuously, and had had no manure applied for seventeen years. In St. Kitts the range in the amount of lime required for sugar-cane lands varies from nil to about 6,000 lb. The position as to what amount of lime should be applied in practice is very complex, as matters stand at present. There is no doubt that cacao and limes can grow well in acid soil. Little is said as to the position in this respect in Hawaii, but it is inferred from the bulletin under consideration that, as in the West Indies, nothing but careful field experiments, carefully controlled by laboratory investigations, can demonstrate what is required as regards lime in agricultural practice. This general conclusion has been arrived at by Sir. Francis Watts, whose paper in the *West Indian Bulletin* (Vol. XVI) dealing with the whole question of liming, should be referred to by all those interested in the subject.

INSECT NOTES.

SUGAR-CANE AND HARDBACK GRUBS IN ANTIGUA.

The Entomologist of the Imperial Department of Agriculture paid a visit to the Northern Islands in March of this year, to investigate certain insect pests of crops in those islands. The following is reproduced from his report to the Imperial Commissioner of Agriculture, on his return to Barbados:—

The hardback grub still continues a serious pest of sugar-cane and other crops in Antigua.

The grubs are to be found most actively feeding from July or August, to January and February. About March or April they stop feeding, change to pupae, and then to adult beetles, which issue forth with the early rains in April or May. Most of the beetles come out of the ground at about the same time, and egg-laying appears to take place within a short time of emergence, and not to extend over a very long period.

Planters know from experience that from August on to March or April, in those sections of the island where the grubs have occurred, sugar-cane cuttings newly planted, corn, onions, sweet potatoes, and yams are liable to suffer from attack.

During my visit in the only locality where the insects were abundant, I found more than half of those dug up were in the pupa and the beetle stages. The beetles found were still in the pupal cell. This is a closed cavity in the soil, which the full-grown larva has prepared, and where the change from larva to pupa, and from pupa to beetle takes place. Some of the insects transform near the surface, and others go deep into the soil.

The hardback grubs appear to attack field after field, and not to remain year after year in the same field. Plant canes appear to be less attacked than ratoons.

The beetles on emerging from the soil with the first good rains in April or May, appear to be attracted to trees or bushy plants where feeding and mating take place at night. During the day they hide, probably in the ground. The eggs are laid in the ground near the places where the adults have congregated. If the beetles have emerged from the soil of a field where the canes have just been cut, they will probably fly away to trees or to standing canes, while if they emerge from the soil of a field where canes are still standing, it is likely that they may reinfest the same field.

If the history of a certain number of fields could be obtained, giving the dates of planting and reaping of all the crop grown over a period of years, and the seasons in which grub attacks have been noted, with information as to the severity of the attacks, much light might be thrown on these points, and the lines of future observations might be indicated.

At any rate, this habit of flight would seem to explain why the attack is experienced in different fields in different seasons; and the supposition in regard to beetles coming out of the soil in fields where the canes are still standing, would explain why certain fields from which canes have been reaped are so badly infested as to make it impossible to grow satisfactory crops of corn or onions, and difficult to establish the next crop of canes.

Hand collecting of the grubs appears to offer a means of greatly reducing the numbers of grubs in the soil, and this collection is much helped by the use of a trap crop which attracts them to its roots. Indian corn is a most useful plant for this purpose. Its roots are all near the surface of the soil, and the grubs are thus attacted to the upper layer where they can easily be collected. It is a quick growing, vigorous plant which quickly shows root injury, and being a surface-rooted plant, it is easily pulled out.

In Mauritius the Phytalus beetle is captured on traps consisting of leafy branches of bush or trees stuck in the soil from which the beetles are emerging. The beetles climb upon these branches at night, and they are searched for with lights. Enormous numbers are captured in this way. *Phytalus smithi* is also collected in Barbados in very large numbers. They are found on canes pigeon peas, and other plants. If corn could be planted in an infested field as soon as the canes were off, and early enough for the corn to be well-established by the middle of April, many beetles might be attracted and collected at night.

If the foregoing observations on the life-history of the beetle prove to be correct, it would appear that as far as grub control is concerned, it would be good practice to allow the cane on badly grub-infested fields to stand until after the emergence of the beetles, in order that they may deposit their eggs on the canes in the same field. As soon as the canes are cut, the land should be worked and planted with corn; when this is attacked it should be pulled, and as many of the grubs as possible collected from the soil, and corn planted again. If many grubs have been left in the soil at the first collecting the second crop of corn will be attacked, and the pulling and collecting should be repeated. Practical financial considerations, however, may dictate the early harvesting and milling of badly attacked canes, in order to avoid the loss in weight and quality which ensues when unhealthy canes are allowed to remain standing for any length of time after becoming ripe.

While the use of the trap crops of corn seems to be fairly well understood, it may be well to emphasize points in connexion with it. One point is this: that when corn is planted in infested fields for the purpose of trapping grubs, it should be considered that the corn is planted entirely for the purpose of grub control, and that no yield of grain should be expected from it. Another point is, that when the attacks of the grub on the corn become fairly noticeable, not only the attacked plants, but all the corn should be pulled, and the grubs carefully collected.

Poultry and pigs, and certain wild birds feed upon the hardback grubs, but these do not seem to be present in sufficient numbers in Antigua fields to exert much influence on the prevalence of the pest. In certain sections of Antigua the blue gaulding is abundant, and worthy of mention in this connexion. This bird is a valuable insect eater, and it is well that it is protected in the island. It is often to be seen in cane fields, and there can be no doubt that it eats the hardback grub, and probably finds and eats the beetles also.

The parasites which attack this kind of insect in other localities seem to be of little value in Antigua, so far as has

been ascertained. It may be stated, however, that even with an abundance of parasites, the control exerted by natural enemies is only partial. In Barbados, Phytalus is parasitized by Typhia, but the control is so incomplete that the pest is spreading, and the damage increasing year by year.

On many estates in Antigua root disease is very prevalent, and in certain places, damage attributed to grubs is purely a matter of root disease attack associated with a lack of tilth in the soil. The ordinary crop system in Antigua resultsin the fact that, at the end of nearly three and a half years of cultivation under cane only, a short period of eight to ten months ensues before canes are planted again. Many of the Antigua lands are heavy, any lose tilth rapidly Organic matter is not supplied in sufficient quantity to the plant canes to maintain a deep tilth for the ratoon crops, and it is noticeable, especially where canes are attacked by root disease, that in some places the ratoons are not *in* the soil but *on* it; that is to say, that the roots have been crowded out of the lower layers by the packing of the soil, or loss of that condition known as tilth, and are all in the few inches of open soil on the surface. Such canes are bound to suffer in any period of drought.

Root disease is to be controlled by rotation, the reduction of ratoon series and the use of large quantities of organic matter. The system of cultivation prevalent in Antigua cannot be called rotation. Rotation for the improvement of the soil condition and the control of root disease would mean an arrangement in which one full season of from sixteen to eighteen months elapses between the reaping of the last of the ratoon series and the replanting with cane. During this interval several other crops might be grown each one receiving thorough tillage, or some months of pure fallow might be allowed.

The question of drainage of cane fields also needs attention, because drainage is fundamental in connexion with the treatment of heavy soils such as are common in Antigua. Improved drainage must be associated with tillage, and the use of organic manures. This has a direct bearing on the reduction of the losses from root disease. Healthy plants may not be less severely attacked by hardback grubs, but with a better developed root system, and with a soil in better condition for root growth, they will undoubtedly suffer less from the attacks of these insects than plants infested with root disease, trying to grow in badly drained, poorly tilled soil which is open and attractive to roots only for a few inches on the surface.

H.A.B.

ANOTHER SPECIES OF AVOCADO.

In an interesting account of the avocado pear in Guatemala by Mr Wilson Popenoe, Agricultural Explorer, published as *Bulletin No. 743* of the United States Department of Agriculture, a description is given of another species of the genus Persea, which, although well known in Northern Guatemala, has almost entirely escaped the attention of horticulturists in other countries. This fruit is known in Guatemala as the coyo, and with the exception of a brief reference to it by G. N. Collens, in *Bulletin 77*, United States Department of Agriculture, nothing seems to have been written about it.

The fruit closely resembles that of the avocado, but the tree is distinct in foliage and flower. The coyo and the avocado are evidently two distinct species.

Like the avocado, the coyo varies greatly in the form and character of the fruit. Many coyos are very inferior in quality, having large seeds, and coarse fibres running through the flesh. On the other hand, those with small seeds, and flesh free from fibre, are comparable with the best avocados, possessing a distinct and agreeable flavour.

It is not difficult to distinguish the coyo tree from the avocado. In both habit and growth it is quite distinct. The tree is about the same size as the avocado, but the branches have a greater tendency to extend horizontally from the trunk. The tips of the branchlets, as well as the lower surfaces of the leaves, are covered with a heavy brown pubescence not seen in the avocado. The leaves are as a rule broader, and less pointed at the apex than those of the avocado. The flowers are borne on shorter and stouter racemes than those of the avocado, and are easily distinguishable from the latter by a blotch of deep orange or red at the base of each segment of the perianth. All parts of the inflorescence are covered with a heavy pubescence.

In Northern Guatemala, at elevations of from 500 to 1,500 feet, the coyo ripens from the latter part of June until August, the season thus corresponding with that of the West Indian race of avocados.

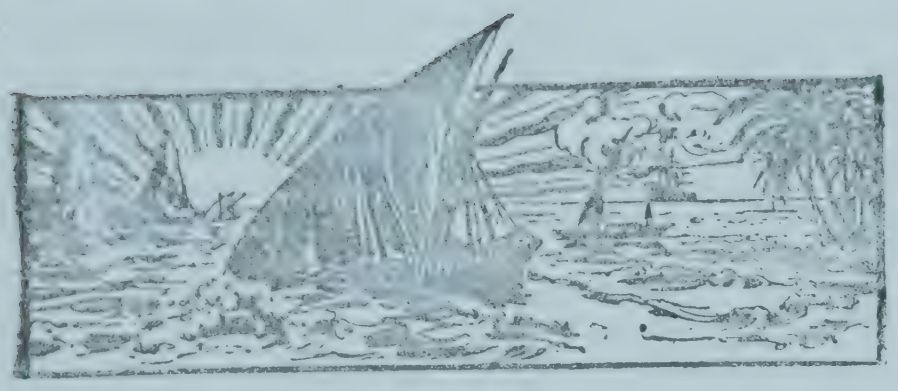
In form, most of the coyos are slender and bottle-necked, resembling in appearance a medium sized avocado of the West Indian race. The best varieties of coyos weigh from 16 to 20 oz. Most specimens are light green in colour when ripe, with numerous large, yellowish-green spots. Sometimes a bronze-coloured fruit is seen, but the deep purple of some avocados has not been observed among the coyos. The skin is thick, but soft and pliable, resembling in texture the skin of West Indian avocados, but approaching in thickness to the thickest skinned varieties of the Guatemalan race. When properly ripe the skin peels readily from the flesh.

The point, however, which easily distinguishes the coyo from all avocados, is the colour of the flesh. This varies from brownish white to pale brown. When squeezed, a milky juice exudes from the flesh, which is of about the same texture in good varieties as the flesh of a good avocado.

In flavour, the coyo is quite distinct from all avocados. It has a peculiar and very agreeable richness, similar to that of the avocado, but characterized by a well marked flavour of ripe coco-nut. Good coyos are exceedingly rich in flavour, and are considered by many people as superior to the best avocado. The coyo is eaten in the same way as the avocado.

The coyo grows on soils of various types, from sandy loam to heavy clay. It grows well in the tropical heat of the coast lands of Guatemala, as well as in the cool climate of the higher interior. It is a vigorous, robust tree, requiring no more care than the avocado. The coyo would seem to be worthy of attention on the part of horticulturists in the tropics and subtropics generally.

Farm Schools in Cuba.—An illustrated article appears in *Revista de Agricultura Comercio y Trabajo*, describing the work done at the Cuban farm schools. These institutions appear to be doing very good work. They train boys and youths for all kinds of agricultural occupations. Practical instruction is given in the cultivation of all the important crops grown in the country. The schools are residential, and are provided with good workshops, laboratories and class rooms. In connexion with the proposed developments in agricultural education in the British West Indies, the work of these schools should receive attention. There are six altogether, one situated in each province. Their aim is to turn out 'scientific masters of cultivation.'



GLEANINGS.

At an estate on the east or windward coast of Antigua, there are approximately 30 acres of land planted in sisal, and 10 acres in henequen (*Agave fourcroyoides*).

The exports of rubber from India have increased remarkably since the outbreak of the war. The total quantity shipped in 1917-18 amounted to 8,430,000 lb., the highest on record. (*Report on the Progress of Agriculture in India* for 1917-18.)

According to Ceylon rubber research results, reviewed in the *India Rubber Journal* recently, acetic acid has again been proved one of the best coagulating agents. It is found also that latex should not be diluted on plantations except under unusual conditions.

A note appears in the *Experiment Station Record* for January 1919 on the subject of grasses in the West Indies. Work in this connexion has been done by Hitchcock and Chase, dealing more particularly with the grasses of Bermuda, the Bahamas, and Trinidad and Tobago.

The English journal of science, *Nature*, contained recently an obituary notice in connexion with the death of Mr. C. K. Bancroft of Barbados, formerly Assistant Director and Government Botanist, British Guiana. The considerable scientific achievements of this officer are recorded in some detail.

The effect of linseed, cotton, and sesamum oil cakes on the composition of milk and butter fat has been investigated in India. According to the *Report on the Progress of Agriculture in India* for 1917-18 feeding with sesamum cake reduced, whereas linseed and cotton cakes either maintained or increased the percentage of fat.

The common soil alkalis, calcium chloride, sodium sulphate, and sodium carbonate are very toxic to nitrifying organisms, and if present in the soil to any great extent, will greatly reduce the nitrogen accumulated as a result of nitrifying in such a soil. (*Journal of Agricultural Research*, January 27, 1919.)

Raw juice straining at the Antigua Sugar Factory is described in an article by Mr. L. I. Henzell in the *Louisiana Planter* for May 24. A rotary strainer was used, and 50 per cent. of the solid matter in the raw juice was removed. A sketch of the appliance is published in the letter press of the article.

The present area under sisal in the East Africa Protectorate was estimated at 15,000 acres in 1916-17. The monthly production was at the rate of 400 tons. One large hydro-electric plant has been established to supply various factories with power, and the construction of other power stations is contemplated (*Colonial Reports* — Annual, No. 988.)

The Jamaica correspondent of *The Times* states that in the Trinidad development scheme it is provided to expend not less than £2,272,283 to improve the communications of the colony and the tapping of resources. The proposals include the taking over by the Government of coastal steamers, improving the harbours and roads, and extending the railways.

In the Monthly Reports of the Grenada Agricultural Instructors, for May, reference is made to the excellent prices ruling for cacao and lime juice, and it is interesting to note also the increasing attention that is being paid to the cultivation of yams—a crop the cultivation of which the Grenada Department of Agriculture has made special efforts to encourage during the past two or three years.

Reclamation of sand dunes receives attention in the *New Zealand Journal of Agriculture*, and the systems, described are of some interest in regard to the reclamation of littoral dunes in parts of the West Indies. It is stated that operations should be started where the sand drift has its source. In Southern Florida casuarina trees are used for reclamation work, more particularly as shelter-belts. Their use in this connexion can be seen in a modified extent in Barbados.

A summarized statement of the factors which influence the yield and consistency of ice cream appears in the *Experiment Station Record* for January 1919. With pasteurized cream, the average yield of prepared ice cream was 4·72 per cent. higher from cream twenty-four hours old than from fresh cream, and there was a further increase with still older cream. The body of the ice cream made from fresh cream was weak and coarse, that from twenty-four-hour-old cream was fairly satisfactory, and that from the forty-eight-hour-old cream was a trifle light.

Plans for the erection of a plant in Trinidad for the manufacture of bamboo paper pulp have been completed. The machinery has been ordered from the United States of America. The shortage of paper has caused a Scottish publishing house, in order to make sure of its future supplies, to turn its attention to Trinidad. This firm has planted 1,000 acres of land with bamboos, in addition to securing a concession to cut bamboos on Crown lands in the island. In due course paper pulp will be manufactured from the bamboo. (From *The Times*.)

An interesting note on anthelmintics, or worm destroyers appears in *Physiological Abstracts* for April 1919. The most effective substances are aspidium, chenopodium, pelletierin, thymol, beta naphthol, and chloroform. Fresh pumpkin and squash seeds are highly efficient. Spices and 'sharp' substances are also toxic to worms. The value of the substance was discovered by studying their action on ordinary earthworms. All substances which prove poisonous to earthworms are poisonous to worms which infest the intestine of man and animals.

THE AGRICULTURAL OUTLOOK IN MONTSERRAT.

The following observations are taken from Mr. W. Robson's Report for 1917-18 on the Agricultural Department, Montserrat :—

The present boom in the Sea Island cotton industry, which is evidently directly due to war requirements, has resulted in an unprecedented measure of prosperity to the inhabitants of this island, the value of the crop of the 1917-18 season being in the neighbourhood of £67,000. That the present prices paid for the lint will be maintained after the cessation of hostilities is probably more than can be hoped for, but all the information to hand indicates emphatically that the immediate future prosperity of the island is intimately bound up with the successful cultivation of Sea Island cotton. It is therefore incumbent on those having the administration of the affairs of the island in their hands, as well as the growers themselves in their own interests, that no stone should be left unturned which makes for the stability and permanence of cotton as a cultivation. During the present high prices, every acre of land for which labour can be provided is being planted in cotton, which means that on many estates the same fields are being planted in the crop year after year without manurial application, and the absence of a definite rotation of crops is perhaps the chief weakness in the island's agriculture at the present time.

While there does not appear to be any annual crop in view at the moment that is likely to satisfy the requirements of cotton estates of limited area as a money-yielding rotation crop, there would seem to be much that can be done by growers to build up the fertility of the land by suitable rotations with green dressing crops. It does not seem to be good agriculture to throw a field that has grown several crops of cotton out of cultivation for a year, when green dressing crops can be grown at a minimum of cost, though it is admitted that out of consideration for the stock maintained by the estate, it is sometimes necessary to do this. The neglect to provide for the maintenance of the fertility of the land applies especially to the lands of small holders, and it is difficult to recommend measures to meet the requirements of persons who wish to have every yard of their property in constant cultivation, except to accumulate as much pen manure as possible by the aid of stock.

Just to what extent certain areas that are now considered to be only moderately well suited for cotton cultivation can be improved by more intensive methods of cultivation, such as the provision of wind-breaks, the draining of the land, etc., is a question for the owners of land to consider, but it would seem to be in times like the present when large profits are being made from the crops grown, that measures like those mentioned should be taken to increase the permanent value of the land.

Apart from the questions raised in the foregoing remarks, there does not appear to be much that is objectionable in the methods in vogue at present in connexion with the cotton crop.

The stimulus given to the sugar industry after the outbreak of the war has in a large measure fallen away, and the area in plant canes is considerably less than in the previous year. This is largely accounted for by the scarcity of labour on sugar estates, due to the attraction of higher wages to the labourers on cotton estates, and in certain sections of the island, to the practise of allowing the labourer to grow cotton on the share system.

Minor industries, including papaw and onions, continue to be very much neglected, but revivals in this connexion can be looked for, if cotton becomes less attractive as a cultivation.

The lime cultivation in the island continues to be a considerable source of anxiety to those responsible for it, and though the actual exports of lime products in 1917 are larger than those of the two previous years, this is as explained on a later page of the report, and cannot be attributed to any improvement in the general condition of the areas cultivated.

In view of the many problems involved in connexion with lime tree diseases under our conditions, it is admitted that the fit and proper person to resolve the various factors into their appropriate places is the scientific agriculturist, who has had an opportunity of closely observing lime cultivation under the various conditions existing in the West Indian islands, and who can at the same time co-ordinate the results obtained with similar cultivations in other parts of the world In this connexion it can here be stated that the Mycologist of the Imperial Department of Agriculture, Mr. Wm. Nowell, D.I.C., in a recent report stated : 'the idea that Montserrat is troubled by some specific and special disease of its lime trees, as compared with, say, Dominica, has in my opinion no foundation'.

This being taken for granted, the problem to be faced in this island by lime growers is whether healthy areas of lime trees can in the future be successfully established, and in view of the results obtained in this direction during the last twelve years, there may be considerable doubt as to the future of the industry. It is often claimed by lime growers that there has been a definite change in the climatic conditions existing in the island, in the direction of dryness, since the hurricane of 1899, and excepting that the four years immediately preceding the hurricane were particularly wet ones, there is no definite substantiation of any marked change so far as the actual precipitation is concerned. There may possibly have been a great falling off in the humidity as a result of the denudation of the forests by the hurricane. As, however, the major portion of the existing lime cultivation in the Grove and Richmond neighbourhoods was successfully established subsequent to the hurricane, the theory that climatic change is the primary reason, would not seem to explain fully the comparative failure to establish regular areas within the last twelve years.

So far as can be gathered, the question of the decline of areas in lime trees has troubled the industry ever since its inception, and the policy adopted has been to replace fields showing decline by others on a different site, which in turn being a success, the area in limes has always been more or less maintained. Now that the new areas planted are from various causes not producing the results anticipated, the very existence of the lime industry is threatened with extinction.

Considerable attention has been given to matters pertaining to the cultivation of lime trees, and the difficulties experienced in connexion therewith.

The measures recommend for consideration by lime growers are : (1) the artificial control of scale insects on young trees by regular spraying ; (2) the provision of lateral shelter in young fields by means of green-dressing plants, e.g., pigeon pea ; (3) the provision of more effective wind-breaks ; (4) judicious manuring of the trees ; and (5), in some instances, the draining of the land.

PLANT DISEASES.

INVESTIGATION OF THE FROGHOPPER PEST AND DISEASE OF SUGAR-CANE *

(Concluded.)

MANURING.

'The subject of manuring, while I regard it, together with that of cultivation, as of most importance, is at the same time the one on which, owing to the variety and complication of the local factors concerned, it is most difficult to offer more than general counsel.

'*Pen manure.* 'One may state with assurance that much more pen manure should be used: the average manager will heartily agree, but enquire where it is to come from. The question should have the close attention of owners and their representatives, so that liberal expenditure on the construction and modernization of pens may not only be allowed, but an active policy in this direction demanded. Everything should be done for the conversion of the largest possible amount of material into pen manure, and for its preservation in good condition. The best means to adopt might, with advantage, be made the subject of a special enquiry. Much improvement on present practice is certainly possible.

'It would be one of the advantages of rotation of crops that more stock food could be grown on the estate, and this, combined with an increase in implemental cultivation, would enable more animals to be usefully and economically kept.

'Connected with the subject of pen mauure there is the difficulty in regard to many fields of its transport over traces made impassable to carts for much of the year by mud. This is given, and with obvious justification, as the reason for the remoter areas on some estates being starved. The difficulty is one which from its magnitude can only slowly be removed, and it seems a pity that in the long history of the estates in question, no policy has been adopted of gradually building up the traces. Their condition involves a tremendous annual waste of energy, and is an effective check to the practice of good agriculture. The army transport services of several great nations have been contending for years with similar difficulties in Flanders, and some of the methods worked out might find an application in Trinidad. There are sections in the Naparimas where the control of root disease requires the services of an engineer rather than of a mycologist, and where a steam roller working on the traces would have more effect on the crop than a steam plough in the fields.

Green dressings. 'The matter of green dressings is not so simple as it looks, nor so well understood as it might be. There is a good deal that is doubtful as to what happens to the material under various conditions of soil and moisture, and as to the nature and extent of the benefit derived. Recent work in India is throwing some light on these problems.

'The purpose of the green dressing is threefold: to supply organic matter for the production of humus, to open up the soil for the access of air, and, in the case of leguminous crops, to derive a supply of nitrogen from the atmosphere. The first two purposes are served by any kind of plant material, and where sufficient for the purpose, can be produced in connexion with a saleable crop, as is the case with the sweet potato in Barbados, the choice of a legume may be overruled by this consideration, nitrogen being supplied in some other form. If the full manurial effect is needed, a leguminous crop should be grown and turned under complete, or better, its produce in the form of peas or beans used as stock food and returned to the soil in this way. If the produce is sold, the manurial increment is by so much diminished.

'Where a green dressing is thickly sown and forms a dense cover, the protection of the soil is no small part of its value. The need for aeration in the silt soils of the colony has already been referred to, and it would appear that in the choice of a green dressing for these lands, its effectiveness in regard to this function should be a first consideration. The use of a woody, deep-rooted plant is indicated. I would suggest careful trial of pigeon pea, if it is practicable to get the stems turned deeply into the soil. The decay of such material leaves channels for the access of air, and the results of measures taken to this end in India have been surprisingly good.

Mulch. 'Sugar-cane supplies its own mulch in the form of trash. I got the impression, which may or may not be justified, that in this direction as in others, not so much care is taken as in the Northern Islands to make the most of the benefits available from this material. Like the conservation of pen manure, the best disposition of trash is a matter well worthy of being made the subject of a careful enquiry.

THE CHOICE OF ROTATION CROPS.

'What is most to be desired for Trinidad agriculture is a rotation crop with a value sufficient to secure, without a sense of sacrifice, its alternation with cane as a general practice. No such crop is at present visible.

'Among the crops which are available, two lines of development are suggested by the imports of agricultural produce, i.e. the production of stock food and of dholl, in both of which there is a trade of very considerable annual value.

'Of root crops used as food, there are sweet potatoes, yams, eddoes, tannias, cassava and artichokes, all desirable from the point of view of this report, as involving considerable cultivation. The prospects for the development of an industry in the production of farine might be considered.

'Cowpeas and horse beans are already in use, but their position and that of corn is rather that of catch crops.

'Sea Island cotton is unsuited to the soil and climate; the perennial cottons, if planted in mass, would be likely to suffer too much from stainer borne disease

'The position of castor is worth watching.

GENERAL.

'I wish to take this opportunity of saying, in justice to Mr. Williams, Entomologist-in-Charge of Froghopper Investigations, that the main conclusions here set out are those which he himself had reached, or was reaching, though of course I cannot commit him to my expression of them. It is desirable to say this, since his report will appear at a later date than mine. If I have been able in the short time at my disposal to approach a correct diagnosis, such a result was rendered possible only by Mr. Williams's services in the selection of the most important points of vantage, and by the opportunity of reference to the data concerning blight which he has accumulated.

'I have to express my personal thanks for the unfailing consideration and helpfulness with which I was received by all who were concerned with my visit. I am especially indebted to the officers of the Department of Agriculture and of the Board.

* Report by Mr. W. Nowell on his investigations in Trinidad.

'Finally it will be a matter for real regret if anything I have said is taken as a reflection on Trinidad managers. I have tried to point out that the prevailing practices are the outcome of natural causes, may in fact be regarded as arising from the suitability of the Trinidad climate for cane cultivation. I am far from losing sight of the difficulties entailed in working by hand a large estate on a small labour supply, and, considering the circumstances, the results attained by the more experienced managers were, to me, something of a revelation.'

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month ending June 4, 1919 :—

The London Produce Markets have, week by week throughout the month of May, shown a distinct improvement upon the conditions that have prevailed for many months past, both in the quantities of produce disposed of, the number of buyers, and the prices realized. A marked improvement began in the early part of the month in the increased sales, and this has been well maintained, as will be seen from the following details.

GINGER.

At auction on the third of the month ginger was in good supply, Jamaica being steady at 115*s.* to 120*s.* per cwt. Cochin was advanced on previous rates, being quoted at 77*s.* 6*d.*, though some sales of good rough washed Cochin were made at 75*s.* to 75*s.* 6*d.* Calicut was disposed of at 70*s.*, Japanese at 40*s.* to 45*s.*, and African at 45*s.* A week later some small sales were made in Liverpool of Sierra Leone at 40*s.* per cwt., while Calicut fetched 75*s.* and Cochin 80*s.* per cwt.

SARSAPARILLA.

At auction on the 8th of the month this drug was represented by 161 bales of Jamaica, 76 of which were disposed of at prices varying from 2*s.* 9*d.* to 3*s.* for ordinary rough to fair, and 2*s.* 8*d.* to 2*s.* 9*d.* for part mouldy. Of native Jamaica 36 bales were offered, and 8 sold at from 1*s.* 1*d.* to 1*s.* 3*d.* per lb.; 39 bales of Lima and 10 of Mexican were also offered, but none was sold.

CITRIC ACID, PIMENTO, MACE, NUTMEGS, KOLA, LIME OIL, LIME JUICE, ANNATTO SEEDS, CASHEW NUTS, TAMARINDS, SOAP NUTS.

Citric acid has been in full demand throughout the month. Referring to this article, the *Chemist and Druggist* says : 'Quite an important business continues to be done on American account, and this has now considerably depleted stocks on the spot, from 4*s.* 4*d.* to 4*s.* 4½*d.* being asked. English makers have been working on stocks of citrate of lime bought at much cheaper rates than those now prevailing in Italy, so that when these stocks are exhausted it is anticipated that prices of citric acid will have to be higher.' At the beginning of the month pimento was reported steady at 5¼*d.* per lb. at which price it remained at the close. At auction on the 8th of the month mace was represented by the large number of 1,125 packages of West Indian, 350 of which found buyers, fine bold pale fetching 1*s.* 9*d.* per lb., good pale 1*s.* 3*d* to 1*s.* 5*d.*, ordinary to fair pale 1*s.* to 1*s.* 2*d.*, and common from 9*d.* to 11*d.* At the same auction as many as 1,412 packages of West Indian nutmegs were offered, and 450 sold at steady rates, the inferior qualities fetching 1*d.* per lb. less. Kola was fully represented at the same auction by 144 packages only 12 of which were sold ; 6 of these were West Indian and realized from 6½*d.* to 7½*d.* per lb. for fair halves. Five packages of West Indian distilled oil of lime were offered at auction on May 8, realizing 4*s.* 6*d.* per lb., while at the same auction hand pressed oil fetched 13*s.* per lb. Of lime juice it is stated that large stocks have accumulated in London with the consequent lowering of prices, good raw West Indian being obtainable at 2*s.* 6*d.* per gallon. At auction on May 8, some 27 packages of annatto seed from the East Indies were offered but none sold, being held at 4*d.* per lb. Cashew nuts were represented by 57 packages, but no sales were effected. Barbados tamarinds to the extent of 100 packages were also offered but found no buyers.

AGRICULTURAL INSTRUCTION IN GRENADA.

The report of the Agricultural Instructors in Grenada for the month of April has recently been submitted for the information of this Office. The country districts visited by Mr. W. Donovan, Agricultural Instructor, included St. Cyr Mountain and Paradise, Mount Pleasant Station and all the districts in the island of Carriacou, also Westerhall Experiment Station. The work consisted largely of peasant instruction : land settlement work at St. Cyr Mountain, experiment plot at Westerhall, lining out drains for cotton growers in Carriacou, addressing meetings of cotton growers in connexion with the scheme of Prize Holdings.

Concerning progress of chief industries, good pickings of cacao were made on the larger estates. Carriacou's chief industry, cotton, has been a good crop ; large shipments from Marie Galante cotton from the St. Vincent Grenadines were brought into Carriacou and disposed of to cotton dealers. Progress of the minor industries concerned the question of arrangements being made to produce more planting material for the peasants of Carriacou on the spot instead of in Grenada. The standard of cultivation of the soil in Carriacou appears to be improving. Live stock continues scarce.

Parasol ants were reported by the acting Commissioner of Carriacou as doing damage to crops there.

The report of Mr. Cherubim, Agricultural Instructor, deals with similar matters in different localities. Forty-nine holdings were visited in St. Georges parish. Entries for the competition in provision gardens have been collected in several districts. The Agricultural Instructor accompanied the Superintendent of Agriculture in connexion with field work on coco-nut trees dying of red-ring disease. A keen lookout for diseased coco-nut trees resulted in examinations of suspected trees on various holdings. Most cases were negative to 'red-ring'.

Great activity is reported to have been shown by the peasantry in the preparation of the land for the coming rainy season A general improvement in the standard of cultivation is reported.

On the larger estates the picking of cacao was continued during the month, and fair pickings of nutmegs were also made. The present local price for nutmegs is 8c. per lb. The Standard Import Company, a Canadian firm, has established a local agency with a view to purchasing and shipping local products, particularly nutmegs.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, May 29.

BALATA—Venezuelan Block, no quotations; Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 119/6 to 121/-; Grenada, 118/- to 120/6.
COPRA—No quotations.
HONEY—Jamaica, 75*s.* to 90*s.*
LIME JUICE—Raw, No quotations; Concentrated, no quotations.
PIMENTO—5¼*d.*
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD, May 27, 1919.

BAY OIL—Lower, at 13*s.* 6*d.* to 14*s.* 6*d.*
LIME OIL—Cheaper, at 4*s.* 6*d.* for West Indian distilled, and 12*s.* 9*d.* for hand-pressed.
ORANGE OIL—West Indian, No quotations.

Barbados.—Messrs. T. S. GARRAWAY & Co., June 25.

ARROWROOT—$8·60 per 100 lb.
CACAO—$19·00 per 100 lb.
COCO-NUTS—$36·00 husked nuts.
HAY—$4·50 per 100 lb.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations
SUGAR—White Crystals—$8·00.

Trinidad.—Messrs. GORDON, GRANT & Co., July 4.

CACAO—Venezuelan, $26·00; Trinidad, $24·50.
COCO-NUT OIL—No quotations.
COFFEE—Venezuelan, 20c. per lb..
COPRA—$9·00 per 100 lb.
DHAL—$10·50.
ONIONS—$9·00 to $9·25 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $5·00 per 100 lb.
RICE—Yellow, $12·00; to $13·00 White, $12·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., June 19.

CACAO—Caracas, 24¾c.; Grenada, 23c. to 23½c.; Trinidad, 23½c. to 24c.; Jamaica, 17½c.
COCO-NUTS—Jamaica selects, $66·00; Trinidad $66·00 culls, $64·00 per M.
COFFEE—Jamaica, 23½c. to 25c. per lb.
GINGER—16½c. to 18c. per lb.
GOAT SKINS—Jamaica $1·35; Antigua and Barbados, $1·30 St. Thomas and St. Kitts, $1·30.
GRAPE FRUIT—Jamaica, $3·00. to $4·00
LIMES—Nominal $8·00
MACE—40c. to 41c. per lb.
NUTMEGS—18¾c.
ORANGES—$2·50 to $3·50.
PIMENTO—9c. per lb.
SUGAR—Centrifugals, 96°, 6·90c; Muscovados, 89°, 5·90c. Molasses, 89°, 5·785c. all duty paid.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

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CONTENTS.

	PAGE.
Agriculture in Barbados	231
Bahamas, Marine Enterprise at The	233
Book Shelf	238
Cacao Growers and the Cocoa Manufacturer ...	228
Cotton :—	
Sea Island Cotton Market	230
The Past Season's Cotton Crop, St. Vincent	230
Departmental Reports ...	234
Estate Costing	225
Forage Plant, A Solanaceous	235
Fish, Dry Salting of ..	229
Gleanings	236
Hookworm Campaign, The	233
Indian Corn in St. Vincent	237
Insect Notes :—	
Spread of the Mexican Boll Weevil in the United States	234
Items of Local Interest	230
Lima Bean, Large White-Seeded, in Grenada, ...	229
Lime Trees in Montserrat, Improvement of	227
Market Reports	240
Notes and Comments ...	232
Personal Notes	227
Plant Legislation in St. Vincent	237
Records, The Value of ...	232
Rubber Seed Selection ...	227
Salubrities	239
Soil Acidity, New Method of Determining	232
Sugar Statistics, Colonial	226
Sugar-Cane Cultivation in Uganda	232
Sugar-Cane, Measuring the Growth of	233
Thymol *versus* Chenopodium for Hookworm Disease	238

Estate Costing.

SYSTEMS for ascertaining the cost of production, both final and at different stages, are quite common in large manufacturing concerns. A motor-car manufacturer knows exactly the production-cost of his engine and the proportion it bears to the total production-cost of the car. He also knows the production-cost of a cylinder, or even a valve or a simple screw. Not only that, he knows what it cost at any stage in its manufacture.

Similarly a boot manufacturer knows the production-cost not merely of a certain pair of boots. He knows what the soles cost compared with the uppers, and what it cost to give the leather its finish. This is a good example of the value of costing, because, in this particular case of a pair of boots, the uppers cost far more than the soles (owing to unavoidable waste): hence it is very necessary to keep a close check on, and to try and reduce the cost of this the highest item of expenditure.

In agriculture, costing has not yet become general practice. Indeed it never will until good systems of financial book-keeping are adopted first. However, one may presume that large concerns like central sugar factories employ some sort of costing system, and that brings us to consider the possibility of a similar system on the estate.

It will perhaps be simpler, if we first give an example of the application of costing to agricultural work that has succeeded. The particular example we have in mind refers to milk production in England. By careful records it was found exactly what had to be expended in terms of money on different items to produce a gallon of milk. For the sake of demonstrating the principle, we will assume 10 per cent. of the expenditure was on labour, 20 per cent. on home-grown feeding stuffs, 65 per cent. on concentrated feeding stuffs, 1 per cent. on housing the animals, and 4 per cent. on manager's supervision. Now we see at once from these figures, that concentrated feeds is what costs the money in milk production. In consequence it is on this item that there is most scope for effecting economy, that is by reducing expenditure to increase the profits. The costing has shown us, in other words, where to concentrate our energies to effect economies.

If we see from our costing analysis that the expenditure on labour is obviously as low as it will go, we do not worry about it. We concentrate on those items that appear to be excessively high.

The example just given will help to show the general principle of costing. Costing is a different system with entirely different aims to ordinary book-keeping. Costing is internal and inter-sectional, or we might say inter-departmental. In ordinary financial book-keeping, statements of the gross and the net profit over a certain period are aimed at, with the collection of information showing the sources of the profit, together with a statement of the assets and liabilities existing at a certain date. In a complete costing system, the aim is to show the profit or loss on each section of the undertaking, after taking into consideration the use of the assets employed therein. The costing system, more especially in agriculture, should aim at effecting economy in expenditure so as to reduce the cost of production. It also helps to fix the selling prices of the articles produced, especially in relation to submitting tenders in competitive trade; costing also supplies figures for future use, for checking and regulating the various items of cost, and for comparing one year's production with another.

The account books suggested for agricultural costing by Mr. L. F. Foster, F.L.A.A., F.C.I.S., who has recently written on the subject, include (a) Goods, Stock and Stores Received Book, (b) Sales, Stock or Goods Outward Book, (c) Transfer Book or Journal, (d) Wages Book, and (e) Cost Ledger. Perhaps the most essential book from the point of view of the system is the Transfer Book. This book should be used for recording transfers, appertionments and adjustments, between two or more accounts in the costing system, e.g., the transfer of manure from the pens to the fields. No transfer whatsover should be made except through the medium of this book, as otherwise valuable and mutual dealings between two sections of the estate will be unrecorded in any book of original entry.

In the case of free-housing for labourers, the rental value of these houses should be debited to the crops which the men have worked upon. Similarly where land is drained, the cost of the drainage must be written off to the particular fields drained over a number of years, say, five or ten. If the field is used for crops, the various crop accounts will bear the annual charge; if used for grazing, the accounts of the various classes of stock grazed will be debited. Administrative charges, and rent and taxes must be apportioned equitably over the various sections of the estate at the end of the year.

If the financial books have been kept on adequate and scientific lines, the profit as appearing in the Costing Profit and Loss Account should equal the profit as appearing in the financial books. When this proof is established, the two systems, which in themselves have no relation to one another, will be absolute proof of accuracy as far as debits and credits are concerned.

Enough has been said to indicate the general principles of agricultural costing. Every business requires its own system, and consequently no one system can be laid down for every business. For estate work in the West Indies, costing should prove immensely valuable, though, on account of the extra work involved, it might prove equally unpopular unless a costing clerk were employed. There is no reason why a number of such clerks could not be trained, and obtain positions on the larger estates.

Costing, it is believed, would reveal many surprises in West Indian agriculture. The expenditure on artificial manures in some places would be found to be astonishingly high and the expenditure on cultivation astonishingly low. It would be most instructive to learn the true costing for a ton of sugar-cane or a pound of cotton in different places. It would then be possible to see whether yield alone is the determining factor as regards profit and loss. In England an Agricultural Costings Committee has been appointed by the Board of Agriculture, and farmers are being asked to co-operate in the matter of providing accounts for expert investigation. Useful results are likely to follow from this new economic study of farming, and it is a pity that we have not got an official Agricultural Costings Committee in the West Indies.

COLONIAL SUGAR STATISTICS.

The *International Sugar Journal* for June 1919, publishes a brief but comprehensive review of British Colonial Reports for the year 1917-18. In this the position of the sugar industry in some of the sugar-producing colonies of the West Indies, and in Mauritius is dealt with, the exports for varying periods being presented in tabular form.

The sugar and syrup industries of St. Vincent showed a satisfactory increased output in 1917-18, but doubt is expressed as to whether this will be maintained, owing to the attention being given to Sea Island cotton. The total quantity and value of sugar, syrup and molasses exported from this island in 1917 was—sugar 1,264,201, value £11,584 syrup and molasses 81,144 gallons, value £3,102, making a total value of £14,686.

Stimulated by high prices, and assisted by favourable conditions for crop production, the industry has established a modern record for sugar in Jamaica with an export of 32,000 tons for 1917, estimated to have realized £672,000. This represents double the value of the sugar crop of Jamaica forty years ago, when sugar was the chief staple of the Colony, and fruit was still an unimportant minor industry.

In Trinidad, sugar again experienced a year of good prices and good crops in 1917, the figures and values for the years 1916 and 1917, respectively, being as follows: 57,755 tons, value £1,279,369, and 62,654 tons, value £1,459,620. The sugar crop of 62,654 tons was also a record one, being 4,899 more than in 1916, when 57,755 tons were shipped.

In regard to Barbados, the sugar exported in 1917 amounted to 51,960 tons, a decrease of 3,496 as compared with 1916. The quantity and value of the sugar exported during 1916 and 1917 were, respectively, crystals, 38,192 tons, value £753,860; muscovado, 17,264 tons, value £336,448: and crystals, 34,770 tons, value £695,443; muscovado, 17,190 tons, value £360,990. The decrease of 4,214 tons in 1917 below the crop of the previous year, was mainly due to lack of rainfall, the area under which the sugar-canes were grown being practically the same as that of the previous year.

The principal item of export from Mauritius is sugar; the quantities and values during the year 1917 were as follows: sugar. 187,815 tons, value Rs. 54 539,232. The total area under cane cultivation at the commencement of 1917 was 198,366 arpents (1 arpent = 1·04 acres), being 806 arpents more than at the commencement of the preceding year.

RUBBER SEED SELECTION.

The *India Rubber Journal* of London, for May 14, contains the following note on the selection of rubber seed :—

The problem of improving the type of Hevea under cultivation has for many years engaged the attention of botanists in this country, and in the East. It is doubtful whether results obtained in temperate zones would apply in the tropics, but any information dealing with this question is well worth recording, since it may prove useful to investigators on rubber plantations. Dr. Cyril West in a contribution to the *Annals of Applied Botany* discusses the influence of the degree of maturity of the seed at the time of harvesting upon its germinating capacity. It is obvious that on a rubber plantation, the seed may be harvested prior to the natural shedding of the fruit, or collected when the fruit season is over. The investigations by Dr. West show that there is a difference in the germinating capacity of seeds collected at these two periods, in so far as certain plants in the temperate zone are concerned. He points out that the problem is made more difficult by the fact that the length of time during which seeds are stored before being tested for germination is very variable. Immature seeds are less tolerant of storage in the dry condition than mature seed. Dr. West points out that the total yields from immature seed are generally less than those from mature seeds, because a smaller percentage of the immature seeds germinate. Furthermore, he states that when comparisons are made between yield per plant, the difference in favour of the plants from mature seeds tends to disappear, or even to be reversed. He reminds us, however, that while the yield per plant in the case of the mature seeds represents an average based on a whole population (vigorous and weak plants), the yield per plant in the case of the immature seeds probably represents an average based on the more vigorous members of the population only. It is interesting to learn that in the case of certain cereals, seed harvested at a stage prior to maturity may, under certain conditions, give a better yield than seed allowed to become perfectly ripe upon the parent plant.

IMPROVEMENT OF LIME TREES IN MONTSERRAT.

The decline of lime cultivation in most parts of Montserrat has been the subject of much investigation and discussion for many years. It appears to be due to several factors which have operated against this crop slowly but steadily, even since the industry was first started.

A correspondent who has recently interested himself in the subject has forwarded us a few suggestions which appear to be worth consideration. He believes, what has been recognized for some time, that the principal trouble in Montserrat is the lack of atmospheric humidity and irregular soil water-supply. Our correspondent suggests the planting of wind-breaks not over 20 feet high, the planting of green dressings, between the trees and the application of green mulch. The soil around the trees to a radius of 3 or 4 feet should be kept clear. Where the soil is found to be hard and cakey, light forking might be found useful, but the soil should never be turned over, the fork being driven into the soil, carefully shaken, and drawn out at intervals of about 6 inches at a time. To these suggestions we might add the planting of Gliricidia between the trees to keep the atmosphere still and moist. Demonstration plots have clearly shown the value of this at the Montserrat Experiment Station.

Our correspondent's chief suggestion, however, is in connexion with manuring. He advises the application of a quick-acting nitrogenous and potash manure like Nitrapo, which has recently been introduced into the West Indies. Such a manure is claimed to stimulate root development as much as the growth of stem and leaves. The cost of this manure, applied at the rate of 250lb. per acre, would be about $15 c.i.f. Montserrat. It is suggested that the manure should be applied, say, once every three years; but this would be determined by the effects produced after the first application.

PERSONAL NOTES.

Mr W. C. Fishlock, Curator of the Experiment Station, Virgin Islands, has been appointed to the post of Agricultural Instructor, Gold Coast. Mr. Fishlock has been connected with the Imperial Department of Agriculture for the West Indies for many years. He has done a great deal to improve agricultural conditions in the Virgin Islands, and his removal will be a loss to those islands and to the Department.

We learn that Mr. G. A. Jones, formerly Assistant Curator, Dominica, is doing good work in his new post on the St. Madeleine estates, Trinidad. In addition to general instruction work, he has organized a large number of co-operative credit societies amongst the small growers.

The *West India Committee Circular* of June 12, states that Professor Maxwell-Lefroy, formerly Entomologist on the staff of the Imperial Department of Agriculture for the West Indies, is credited with having saved the British Government £14,000,000 by devising means of purifying the last four Australian wheat crops, which could not be shipped owing to lack of tonnage, and became weevily. He invented a machine which, heated to 140° F., kills the weevil eggs as the wheat is passed through it. Professor Lefroy also did good work in Mesopotamia, where he was given a free hand in the direction of sanitation. He has now returned to his normal position as Professor of Economic Entomology at the Imperial College of Science, London.

CACAO GROWERS AND THE COCOA MANUFACTURER.

Mr. A. W. Knapp, B.Sc., in the following article, published in the *West India Committee Circular* for June 12, discusses the position of the cocoa manufacturer in regard to cacao cultivation. This discussion arose out of an editorial in the *Agricultural News* last March, to which Mr. Knapp refers in the course of his article. Mr. Knapp maintains that the cocoa manufacturer has been, and is ready to assist the grower by stating his exact requirements. While we admit the manufacturer's willingness, we maintain that in the present state of technical knowledge of cacao samples, it is not possible for the manufacturer to enumerate his requirements scientifically, that is definitely, in the same way the cotton spinner can enumerate his requirements. The valuation of cacao samples is too qualitative, too much a matter of opinion to be satisfactory. It is a subject calling for scientific study and research.

The various points raised in the quotation from the *Agricultural News* in the *Circular* of May 1, as to the need for increased efficiency in cacao cultivation are very interesting, and open a wide field for controversy. Attention is called to the fact, that the producers of the raw material are singularly ignorant of the requirements of the users of that material, and it is contended that this is more the fault of the cocoa and chocolate manufacturers than of the growers of cacao.

The writer in the *News* adds that, doubtless much better results could be obtained in the production of the raw cacao, if the needs of the manufacturers were more accurately known. It is only fair to the manufacturers to state, that they have always been willing to give their opinion on any new cacao coming into the market. I refer here to the reports which the Imperial Institute publishes in their Bulletin from time to time on cacao from countries which are starting cultivation, and on experimental lots of cacao. The study of these reports would reveal to the ardent planter the particular properties in cacao which the manufacturer specially seeks for, and it would show that, while the manufacturers agree in a general way as to their requirements, they disagree in some of the smaller details.

The organizers of the Congress of Tropical Agriculture (held in London in 1914) also felt that it would be an advantage if the needs of the manufacturers were actually known, and at their request, Mr. N. P. Booth and the writer gave a paper on 'The Qualities in Cacao desired by Manufacturers.' In this paper, which is published in the *Transactions*, will be found a discussion on unripe cacao, flat beans grubby beans, etc., together with some remarks on the effect of washing, drying, cleaning claying, dancing and polishing from the manufacturers' point of view. In a general way, the planter already knows what the manufacturer wants, namely, sound, well-cured cacao. The manufacturer would be coming outside his true province if he attempted to tell the planter how to prepare the raw cacao, but he may perhaps be permitted to say that, in his opinion, if the planter only allows ripe pods to be gathered, ferments for a reasonable period, cures with care, and keeps the beans dry, the cacao will have the appearance and properties which the manufacturers desire. 'You cannot make a silk purse out of a sow's ear', and you cannot, by any method of fermentation or curing, convert Calabacillo or Forastero cacao into Criollo cacao. A planter can only do the best he can with the cacao on his plantation. Probably the simplest and most effective means of educating the planter as to the needs of the manufacturer, is for the manufacturer to pay a higher price for the better cured cacao from any particular district. One can but think that as long as the difference in price of ordinary and estates cacao from the same district remains so small, any attempts on the part of the manufacturer to explain exactly what he wants will not be very productive. Unfortunately, prices are beyond the control of any individual manufacturer, and will continue to be governed by the New York and European markets. It may be pointed out, however, that if the greater number of planters in any producing area, ferment and cure the bean in a conscientious manner, their efforts tend to raise the price of the whole of the cacao from that area. It would probably be a considerable help to the planters in various parts of the world, if their Agricultural Department, or Agricultural Society, would purchase specimens from a London broker, of all the kinds of beans submitted at any particular auction, and exhibit them together with the prices they obtained. There are planters who have seen little or nothing of the cacao produced in other countries, and a comparison of the beans and the prices could not but give them some enlightment on this subject.

The comparison of the prices paid for various growths will show that the botanical variety is, if not the principal, one of the most important factors influencing these prices. The prices fixed in 1918, though influenced by disturbing factors, give one some idea as to the effect of botanic variety on prices. With Trinidad at 90*s.* per cwt., and as equally well-prepared Ceylon at 100*s.* per cwt., we see the difference in price due to Criollo and Forastero. On the other hand, although Arriba and Machala (Guayaquil) cacao is a finer bean than that of Trinidad, it is carelessly prepared, and hence only obtains the same price as Trinidad. Grenada cacao is almost perfectly prepared, but it is a mixture of Forastero and Calabacillo, and the beans are the smallest of all well-known cacaos, and have a high percentage of shell, and hence we find its price fixed at 85*s.* per cwt.

No improvements in fermentation or curing are likely to make Grenada cacao fetch the same as Ceylon, and it is quite unnecessary to tell the Grenada planter that his beans should contain no unfermented, germinated, unripe, overripe or grubby beans, because the estates cacao from Grenada is almost entirely free from these defectives. Indeed, the standard of preparation on Trinidad and Grenada estates is as high as anywhere in the world, and the cacao generally contains as much as 94 per cent. of perfectly prepared beans.

The manufacturer has occasionally to refuse cacao because he finds that it has a foreign odour, due, presumably, to imperfect fermentation. Such foreign odours are rarely found in West Indian cacao, but the practice of allowing the 'sweatings' to soak into the ground in the vicinity of the sweat-boxes, and decompose only a a few yards from the beans, must occasionally lower the quality of the cacao produced.

On the whole, the present day feeling of manufacturers is against the washing of cacao, nor is claying or dancing recommended. As is well known, washing the fermented bean makes the skin thin and brittle, and hence detrimentally affects the keeping qualities. Clay, in my opinion, is camouflage. Certain estates in Trinidad do not clay and their cacao keeps perfectly. Claying results in a more

uniform appearance, and clayed cacao tends to obtain a higher price, which means that the buyer has been deceived to the extent of any increase in price that he pays Apropos of the deceptive appearance produced by clay, I may say that two lots of 'black' diseased Trinidad cacao were once sent to a reliable firm of London brokers. They were sent in their natural condition, and also with their dirty shells hidden by a thin coat of clay. The English broker never sees 'black' cacao in bulk. He is only aware of its existence when the merchants in the tropics mix a little of this clayed, diseased cacao with the good cacao. The effect of mere claying was to enhance the value in the broker's eyes to the extent of 13*s.* per cwt. in one case, and 18*s.* per cwt. in the other. However, the manufacturer would soon find such cacao gave an inferior product, and become suspicious of cacao with that mark, and it is doubtful if the broker would be deceived in this way a second time. Dancing is interesting to watch, and adds a little gloss to the beans which some may like, but in my opinion it adds nothing to the intrinsic value of the cacao.

Looking at the subject broadly, it would appear that the direction in which the West Indian planters can increase their efficiency is by the continued study of agricultural methods. For example, if Trinidad planters adopted manuring, etc., as in Grenada, they would doubtless increase their output. There are many directions in which practice lags behind knowledge. Thus, the Department of Agriculture in Trinidad has shown the amazing difference in the individual yield of trees, and if this knowledge can be applied, obviously the output can be greatly increased.

With the most expensive varieties of cacao, taste, fashion and processes influence the manufacturer in his purchases, but under any conditions, he always requires a large supply of good, sound cacao. I gather that there is very little room for further planting in Grenada, but if planting were done there, it would be an interesting question to decide whether it were better to plant the present hardy variety, with its small, inferior bean, or the high class Criollo, which is the more delicate tree. It is hard to understand why, in progressive islands like those of the West Indies, grafting has never been tried on a large scale. I have always understood that Hart discovered in 1898, that grafting was a success, and I remembered that the two unshaded trees in the St. Clair Experimental Station, Port-of-Spain (which, I believe, were grafted by Mr. Jackson in 1908), looked hardy and fruitful when I saw them some years ago. It would be of value at the present time if the *West India Committee Circular* would publish a symposium from leading agriculturists on the improvement of the strain of British colonial growths in general, and of West Indian cacao in particular.

It is probable that the keen competition in cacao production, which the writer in the *Agricultural News* fears in the near future, will be greatly moderated by the continuous rapid increase in cacao consumption; but there can be no disadvantage to the West Indian planter, in his attending closely to the general efficiency of his methods of production.

DRY SALTING OF FISH.

As the result of an enquiry by the Jamaica Agricultural Society concerning the method of curing fish practised in the Turks Islands, the following statement was obtained and published recently in the *Journal of the Jamaica Agricultural Society*:—

The fish is split in three parts, two sides and a central part containing practically all the bones, from the head to the tail, the sides being left hanging by an inch of skin to the tail. The fish is then freely washed in sea-water and hung up for fifteen minutes to drain. It is then laid, flesh up, on a clean board, and the flesh of the sides 'scored' crosswise in inch widths to the skin, care being taken not to cut through the skin. These cuts or 'scores' should be on a level away from the tail, so that when the fish is hung up by the tail the cuts will gape open and admit air. Dry salt is then freely rubbed into the cuts and on both sides of the central bony portion, which should have as little flesh as possible left on it.

In this condition the fish are packed, skin down, one on another, for from six to twelve hours, when it will be found that most of the salt has been absorbed. They are then gently shaken to remove surplus salt, and hung on any improvised racks, so as to keep the three parts into which the fish are cut well separated, and presented to a free passage of air and sunlight.

Care must be taken to protect fish in the process of salting from the washing effect of rains.

LARGE WHITE-SEEDED LIMA BEAN IN GRENADA.

Mr. J. C. Moore, Agricultural Superintendent, Grenada, writes as follows: 'This bean, which appears to be a variety of *Phaseolus lunatus*, was brought to our notice in 1916, when a few plants were observed to be in cultivation in Carriacou and Grenada. Locally, it is a little-known bean, though there are indications that it has been regularly grown in one garden here during the past sixteen years.

'The pods and seeds bear considerable resemblance to those of the Madagascar bean recently introduced in the West Indies by the Imperial Department of Agriculture; but in comparison with the Madagascar, as grown in Grenada, the pods are longer, more curved, and terminate in a much longer ($\frac{1}{2}$-inch) beak. The seeds also differ in that they are noticeably larger and more evenly lunar shaped. Twenty average seeds of the Madagascar weighed 24·8 grams, while twenty of the Large White weighed 29·4 grams.

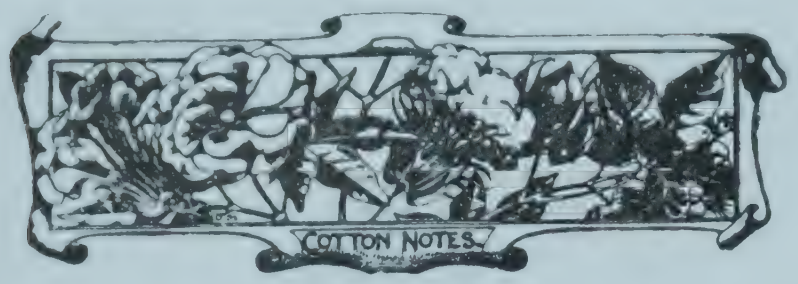
'Like the Madagascar, the Large White is a plant of twining habit, but with us it is the more vigorous grower of the two, while the pods and seeds seem to be less susceptible to disease. In the crops of these two varieties harvested in February last, the percentage of diseased seeds was 27 per cent. for the Large White and 50 per cent. for the Madagascar

'Sown in rich soil in June 1918, eight plants completely covered 1,160 square feet of the nursery shade frame, and gave, in February and March, a crop of 2,992 pods, yielding in dry seed 18 lb. 3 oz —actual weight from 1,944 pods, and an estimated weight of 9 lb. 9 oz. eaten when 'full' by rats, out of 1,048 pods, making a total estimated crop of 27 lb. 5 oz., or an average of 3 lb. 6 oz. per plant.

'The Government Botanist and Superintendent of Public Gardens, Jamaica, to whom some pods were sent, reports that the bean is known there as Broad Bean

'The beans, when full and green, or dry, make an excellent table vegetable.

'The plant requires about six months in which to make its growth. Sown in June, it crops about February. It well deserves a place in gardens where the requisite space for its twining vines can be provided'.



COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended June 28, 1919, is as follows:—

ISLANDS. Since our last report of May 31, the limited unsold stock has been in demand, including all grades, resulting in the sale of almost the entire offerings of the lower grades, and the larger proportion of the planters' crop lots of Extra Fine.

The buying of the planters' crop lots was principally for export to France.

The stock remaining unsold of the crop is very small, leaving available until the next crop only some small lots of the lower grades, and a few planters' crop lots of Extra Fine, which are held at 82c. to 92c, f.o.b. and freight.

There is no stock whatever of bright cotton classing Fine to Fully Fine.

The sales made during the month have been on a basis of :—

Fine to Fully Fine,	@ 60c. to 63c, f.o.b. and freight.
Extra fine,	@ 65c. ,f.o.b. and freight.
Planters' crop lots, Extra Fine,	72c. to 92c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. The limited offerings have continued in demand, taking all grades at advancing prices, the buying being on account of the Northern Mills. The better grades, Fancy and Extra Choice, are especially sought after, but can be found only in a limited way, and even then have to be bought along with a large percentage of the lower grades.

The business of the month may be quoted on the following basis, viz:—

Fancy,	@ 60c., f.o.b. and freight.
Extra Choice,	@ 58c., f.o.b. and freight.
Choice,	55c., f.o b. and freight.

The market, however, is very firm, offerings small, and factors asking higher prices.

The exports from Savannah since May 31, have been, to Northern Mills 1,204 bales, Southern Mills 36 bales, and from Jacksonville to Northern Mills 857 bales.

CROP ADVICES. From recent advices from the factors and planters, we now estimate the acreage planted, viz:—

In Carolina	20 per cent. less than last year.
In Georgia and Florida	25 per cent. to 30 per cent. less than last year.

The crop is reported to be in good condition, but everyone is apprehensive of the boll weevil, which has already made its appearance in some sections. The damage they may do will not develop until later on.

The Government's report on acreage and condition of the crop will probably prove to be our most reliable information.

N.B.—Our next circular report will be issued early in August, giving the Annual Statement.

The Past Season's Cotton Crop, St. Vincent.—Mr. W. N. Sands, F.L.S., Agricultural Superintendent, St. Vincent, writes as follows : Ginning of the 1918-19 cotton crop was 436,980 lb. each. The returns of the Marie Galante crop are not yet complete, owing to the export of seed-cotton to Carriacou, but the crop is not expected to amount to 100 bales, of which 81 have been purchased at the Government Ginnery.

The Sea Island crop was the largest since the 1912-13 season. The actual figures of the heaviest crops hitherto are as follows :—

1910-11	...	...	515,237 lb.
1911-12	...	...	487,116 lb.
1912-13	...	...	443,878 lb.

The smallest crop was in 1916-17 when the yield was 160,168 lb. only.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. Mr. W. N. Sands, F.L.S., Agricultural Superintendent, reports continued dry weather during the month of June, which hindered the preparation of land for cotton planting. Considerable difficulty was experienced in establishing fields, which it is expected will result in a late, and possibly a short crop. The Sea Island cotton crop for 1918-19 amounted to 436,980 lb. of lint, or 1,214 bales of 360 lb. each, of which 682 bales were shipped on June 25. The reaping of the sugar-cane and the manufacture of sugar were continued under good conditions. From the Botanic and Experiment Stations the following plants and seeds were distributed : 3 grafted mango, 27 ornamental, 3 lb. cured cacao, 77 lb. pure bred Sea Island cotton seed for farms.

Special work of officers of the Agricultural Department involved visits to the Mesopotamia Valley for the purpose of inspecting lands offered to the Government for Land Settlement ; also visits to the cotton districts and Land Settlement estates. At the Land Settlement estates at Clare Valley-Questelles, the preparation of land for planting cotton has been hindered by the continued dry weather. Some few allottees succeeded, however, in establishing their plots. At Belair the holders were chiefly engaged in the application of stable manure to their ratoon canes and arrowroot plots. Small plots of cotton have also been planted here. The cultivations on the Cumberland Land Settlement estates, chiefly ground provisions and bananas, now supply local demand, and are not exported as formerly. Observations on the adult cotton stainer were continued with a view to ascertaining the length of time these could live in the absence of regular food-plants, and under natural conditions. The Cotton Inspector was appointed to act as Manager of the Government Ginnery and Granary from June 6, Mr. S. B. Isaacs having been granted three months vacation leave. The rainfall at the Botanic Station was 4·88 inches ; at the Experiment Station, 4·23 inches.

ST. LUCIA. Work of a routine nature was carried on in the Experiment Station and Botanic Gardens during the month of June, in addition to the removal of a few large trees in the Botanic Gardens to allow of the extension of the lawns and flower beds near the centre palm circle. Plant distribution included limes, 1,700 ; grafted mangoes, 2 ; budded oranges, 12 ; grape fruit, 1 ; coffee, 516; orna-

mental, 238; rice, 4lb.; lime seeds, 2 kerosene boxes. The Agricultural Superintendent (Mr. A. J. Brooks), in his observations relating to the staple crops—cacao, limes, and sugar—states that the cacao crop was over, limes were coming in, and good growth was being made by the sugar-cane. Rainfall recorded at the Botanic Gardens, Castries, was 4·80 inches; at the Agricultural and Botanic Station, Choiseul, the record was 3·10 inches.

DOMINICA. The Curator Mr. Joseph Jones supplies the following information in regard to the Lime and Cacao Experiment Stations, and other matters: the lime crop reaped during the quarter April-June was 122 barrels of green limes and 72 barrels of ripe limes, and realized £112 13*s*. 5*d*., 19 bags of cacao were shipped to London, and 1 barrel of samples of grafted cacao to the Imperial Institute. In addition, 2 bags of kola nuts, and 1 barrel of nutmegs were shipped. The plant distribution was as follows: limes, 2,550; budded citrus, 18; grafted mangoes, 2; nutmegs, 6; miscellaneous, 10; cane cuttings, 550; shade tree cuttings, 400; onion sets, 300; horse bean, 11lb.; tephrosia seed, $2\frac{1}{2}$ lb. In addition, 175 packets of vegetable seeds were sold. Regarding staple crops, Mr. Jones observes that the price for ripe limes had risen from 5*s*. to 6*s*. per barrel, while green limes had dropped from 10*s*. to 6*s*. per barrel during the month; raw lime juice was marketable at 9*d*. per gallon. Branches of camphor trees in the Botanic Gardens were found to be attacked by borers. Specimens of the stems and borers were forwarded to the Head Office for examination and report. The acting Assistant Curator left Dominica on June 21 on one month's leave of absence. The weather was dry, the rainfall for the month being 3·88 inches. This, Mr. Jones states, is much below the mean average for June. The rainfall at the Gardens from January 1 to June 30 was 15·47 inches only.

MONTSERRAT. According to notes forwarded to this Office by Mr. A. Gallwey, acting Assistant Curator, the plant distribution during the month of June included 706 bay plants, 40 decorative, 18 economic, $5\frac{1}{4}$ lb. of peas and beans, and 5 packets of papaw seeds. In the Botanic Gardens attention has been given to renovating decorative borders and lawns. Nursery work consisted in the main of potting bay seedlings. Germination tests on onion seeds imported in 1918 gave an average percentage of 81. In his observations relating to staple crops, Mr. Gallway states that in several districts the picking of cotton sown in March had begun. The general appearance of the island's cotton crop compares favourably with that of last year, and prospects of good returns are anticipated. A slight improvement has been observed in the growth and general appearance of the lime trees in the Grove neighbourhood. There were shipped by the SS. 'Crown of Navarre', 222 bales of cotton of the 1918-19 crop, comprised of 142 bales of clean cotton and 80 bales stained. This ship also took away 41,627 gallons of raw lime juice, $15\frac{3}{4}$ tons citrate of lime, 424 gallons concentrated lime juice, and 78 gallons lime essence. Worms (*Prodenia* sp.) have made their appearance on the plot of young ground nut plants, and are causing some damage. Trials with the bleeding of special types of papaw, and the drying of papain have been continued. Farrell's and White's sugar-cane plots have been supplied, and the varietal plots reaped at White's and samples of juice sent to Antigua for analysis. Very heavy gusts of wind were experienced on June 26. On the early morning of June 30 a thunderstorm of moderate violence passed over the island. Rainfall at Grove Station for the month was 3·94 inches; for the year to date, 23·14 inches.

AGRICULTURE IN BARBADOS.

Writing on July 12, the Barbados *Agricultural Reporter* makes the following observations regarding the local cultivations:—

With the closing of the crops everywhere, the question of fodder has become acute. On all sea-board estates, trash has been for a few weeks the only form of support for both cattle and mules. With the recent showers, the grazing pastures will relieve the situation, but, with the most favourable weather, it will still be four weeks at least before green fodder of any kind is available. Vacuum pan molasses has, in this crisis, been a boon in providing nourishment for the animals. On some estates in the driest districts, grave anxiety has been entertained as to the possibility of keeping the animals alive, until grass should be available.

The present condition of the young cane crop makes it impossible to say what will be the final result. With very favourable weather, a saving crop may be made in some districts next year, but grave doubts are entertained of large areas, both in the black soil and in the red. The most favoured crops are to be seen on the hills of St. George (in the neighbourhood of Cottage, Groves and Golden Ridge), in St. Joseph's parish, in some parts of St. Andrew, in the lowlands of St. John, and on the hills of St. Peter. Elsewhere the appearance of the fields as to colour is that of an old crop in the month of May. In St. John, the forward ratoons and the plant canes are in a terrible plight. The former have been stunted, apparently beyond recovery, while the latter hardly ever started in the race.

With the showery weather of the past week, every planter has concentrated on the application of artificial manure, on the stripping of the most booted fields, and on the supplying of the dead holes. Stumping will have to be done very extensively, and, at this late hour, the prospects of a satisfactory return from this work are not encouraging. All, however, depends on the weather during the remainder of the year.

The extra work in connexion with the young crop will cause some delay in the tillage of the fields from which the old crop has just been reaped. Nevertheless, some progress is being made, and ploughing is on the go everywhere. The extra work will bring grist to the mill of the labourers; it is for them to turn out regularly and increase their earnings in proportion.

Wherever possible, the last week has seen the planting of yams, potatoes and corn. Both peasants and estate owners have planted with the hope of relieving, as soon as possible, the present scarcity of local foodstuffs. Yam plants were forthcoming everywhere, but some estates are sending distances to get potato slips.

Enquiries concerning the working and arrangement of the St. Vincent Granary were received in 1918 from other colonies, namely, Jamaica, Barbados, Grenada, St. Lucia, and Antigua. In the case of Grenada, the Superintendent of Agriculture made a personal detailed inspection.

It is stated in *Colonial Reports*—Annual, No. 990, Sierra Leone, that the only way of overcoming the unprogressive mental attitude of the natives is by means of education and instruction combined with the more important policy, which is now being pursued, of establishing for demonstration purposes an experimental farm in each district.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*
**Seconded for Military Service.*

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with agricultural costing, a system which should aim at effecting economy in estate expenditure.

At page 228 will be found an article dealing with the position of the cocoa manufacturer in relation to the grower of cacao.

A new solanaceous forage plant is described on page 235.

Insect notes in this issue deal with the spread of the Mexican boll weevil in the United States.

A note appears at page 229 on the large white-seeded Lima bean in Grenada.

New Method of Determining Soil Acidity.

Soil acidity is the term usually applied when infertility of soil can be corrected by the application of lime. There are many factors which cause this condition, the presence of real acids being only one of them. Methods used for detecting or determining soil acidity generally do not measure the acid there, but may depend upon many properties of soil mass in no way related to acidity. Some recent work by F. E. Rice and S. Osougi, reported in the *Experiment Station Record* for February 1919, has led to the discovery of a method for measuring so-called acidity in soils through the inversion of sucrose in 50 c. c. of a solution of cane sugar, to which has been added from 5 to 10 grammes of the soil to be examined. The power of the soil to catalyze the reaction of cane-sugar inversion is a measure of its acid, and is probably the only method which can measure the acid bound up with the soil solid phase. It might be added by way of explanation, that the expression catalyze means that the soil brings about the inversion without itself undergoing any chemical change.

Sugar-Cane Cultivation in Uganda.

According to the Report of the Department of Agriculture, 1917-18, the cultivation of sugar-cane in the Uganda Protectorate is being gradually extended, and large numbers of canes have been distributed for planting purposes. The varieties include Bourbon, Purple and Yellow, Uba, Sealy Seedling Java and B. Nos. 3922, 1528 and 4596. Encouraging the cultivation of the Bourdon owing to its susceptibility, and the Uba owing to its high fibre content is somewhat curious. In regard to the three last-named canes, it is not clear whether these are Java or Barbadian seedlings. It is stated that several European planters are taking up the cultivation of the crop on a larger scale, but beyond the increase in the manufacture of jaggree, nothing of a more advanced nature is contemplated at present. The department has on order from India an improved type of mill for the manufacture of jaggree, but already small plants are working, and the jaggree finds a ready local market. It would appear from the report that at present there is no extensive development in the matter of cane-sugar production for export, but no doubt the new preference in favour of Empire sugar, recently passed by Parliament in Great Britain will have an effect in the near future upon sugar-cane production not only in Uganda, but in other parts of Africa as well.

The Value of Records.

The United States Department of Agriculture has issued, as *Farmers' Bulletin 1,034*, a very clear and concise pamphlet on 'Growing Sugar-Cane for Sirup' as the Americans now spell what we know as syrup. Most of the information contained in this pamplet is nothing new to sugar-cane planters in the West Indies.

It is pointed out that the production of syrup is usually confined to small plantations, with rather inefficient means of manufacture. Under such circumstances, however, cane syrup is often a profitable article to place on the market, as is well known to planters in Barbados.

One point in the pamphlet is well worth bringing to the notice of planters cultivating small areas. That is, the advantage of keeping careful records. All large concerns have to do this, and it is just as beneficial for a small estate. For instance, it is generally understood that ratoon crops are produced at a much less expense per acre than the plant crop, so that even a considerably less return from the former makes them profitable to grow. If the price of the sugar or cane is high in comparison with the low cost of labour, etc., it would probably be more advantageous to grow only plant canes for the sake of the larger yield. On the contrary, low prices for the product in comparison with high labour wages would make it more profitable to ratoon as far as practicable.

If the planter were to keep an accurate record, through a series of years, of all the labour and other expenses involved in producing the plant cane crop, and of each ratoon crop, and of the receipts obtained from each crop, he would be in a position to plan his system of cropping so as to bring him in the greatest returns per acre. Since, however, the yields both from plants and ratoons vary very much from year to year, due to weather conditions, and since also the prices of sugar and syrup fluctuate, there is need of caution in drawing conclusions from the results of only one or two years. The really valid conclusions must be based on averages obtained from the records of a considerable number of years.

Measuring the Growth of Sugar-Cane.

This subject was dealt with at some length in the *Agricultural News* for October 7, 1916, when the fact was stated that an observer in America measured rate of growth of a sugar-cane by the simple method of inserting a needle horizonally in the growing part of the cane, by which was meant the terminal bud. The holes made served as points from which to measure the growth of the various parts with respect to the outer sheaths around the bud, which had ceased to grow.

According to the *Wealth of India* for March 1919, there is employed in the Dutch East Indies, a specially constructed apparatus consisting of a high, square wooden rule, graduated in centimetres and fitted with a slider, to which is attached a small copper plate graduated in millimetres. Numerous observations with this apparatus are reported to have shown, that the time between the appearance of two successive shoots varies between five and seven days for the local varieties observed. Night growth usually exceeds day growth, but the latter is much influenced by rain, which may cause a day growth superior or equal to night growth.

The Hookworm Campaign.

Although during the past five years reports have appeared from time to time in the local newspapers, few people realize the magnitude and efficiency of the West Indian hookworm campaign directed by the Rockefeller Foundation, International Health Board, New York. On another page in this issue we publish a review of a lengthy publication by Dr. H. H. Howard, Director for the West Indies, which describes in detail the methods employed, and the remarkably satisfactory results achieved. The deep gratitude of all classes in the West Indies is due to Dr. Howard and his co-workers, and to the generous and beneficent founder of the International Health Fund, who have already done so much to relieve suffering and to increase the efficiency of working people in these colonies.

While dealing with this subject of hookworm, it might be emphasized, in connexion with the article at page 238 on thymol and chenopodium, that Dr. Howard has found, in his West Indian experience, thymol to be a much more satisfactory specific than chenopodium. Not only has thymol been found more effective as a cure, but also less likely to produce toxic symptoms. The large demand for thymol as a hookworm specific, and its general value as an antiseptic, raise the question as to whether it could not be produced commercially in the West Indies. Success has attended the experimental cultivation of the Ajowan plant in Montserrat. It is of course from the seed of this plant that thymol is obtained.

Marine Enterprise at the Bahamas.

According to *Colonial Reports*—Annual, No. 978, dealing with the Bahamas for 1917-18, the sponge culture experiments at those islands are giving satisfactory results. The Marine Products Board regrets that it has not been in a position to enlarge the sponge farm, as the specimens of sponge show marked progress, 'and are forcible evidence that sponge cultivation is an enterprise that can be carried on successfully'. Specimens, one a wool, 15 inches in circumference, the other a yellow, 4 inches in height, were exhibited in the committee room of the House of Assembly, and are now in the possession of the Board. These roports, which may be taken as quite reliable, are of a very satisfactory kind, and it would appear that this industry of sponge culture will expand in the near future.

Besides showing enterprise in the matter of sponges, the Board has conducted experiments, equally successfully, in curing bêche-de-mer. The last lot handled by the Board were of excellent quality, but unfortunately they got spoiled during the long voyage to Hong Kong, where they were sent for consumption. It may be noted that commercial bêche-de-mer should be fished from deep water. The shallow water slug is too tough and lean for the best culinary uses. Bahamas fishermen want to take care that they bear this in mind, otherwise the shallow water material may lead to disappointment as regards the obtaining of profits.

INSECT NOTES.

SPREAD OF THE MEXICAN BOLL WEEVIL IN THE UNITED STATES.

The progress of the Mexican boll weevil eastward, across the cotton belt of the United States, has been noted from time to time in the *Agricultural News*.

The spread of this insect in 1917 was noted in this Journal for September 21, 1918 (Vol. XVII, p. 298), when a net gain of 7,300 square miles of territory was recorded. The story of the boll weevil spread in 1918 is a different one from that of 1917. Instead of a gain in territory, the insect suffered a set-back, and the weevil-infested territory at the end of 1918 was 30,500 square miles less than in 1917. Only once before during the history of the invasion of this insect into the United States has it happened that the infested area has been less at the end of a year than at its beginning. That happened in 1896, the fifth year of the invasion.

The total loss of territory by the weevil in 1918 amounted to 46,600 square miles, and the gains to 16,100, a net loss of 30,500 square miles.

The extremely cold winter of 1917-18 was responsible for the death of the weevils over a very large area in a belt along the northern and western limits of infestation. Much of this territory was reinfested during the year 1918, but on account of early frosts in the autumn, and extreme drought, the weevils had failed to reinfest some 46,600 square miles. The gains were made in those eastern States where Sea Island cotton is grown, except for a small infestation of 100 square miles, which marks the first appearance of this insect in New Mexico.

The southernmost limit of cotton cultivation in Florida has been reached. Of the State of Georgia, only a small portion of the north remains uninfested; and in South Carolina, practically all the Sea Island cotton district is infested. This means that almost the entire area in the United States of America where Sea Island cotton has been grown, is now infested with the boll weevil.

The control of the boll weevil in the United States has occupied the best attention of a large number of entomologists and planters, who have been interested in the matter for the past twenty-five years, and nothing has been discovered to prevent the steady progress of this insect throughout the entire cotton belt. Along the northern borders the weevil has difficulty in maintaining itself on account of the cold winters sometimes experienced, and on the west margin, it is adversely affected by drought. No natural enemies capable of exerting an appreciable check on this pest have made their appearance.

For the past six years extensive trials of control by poisoning have been made, with promise of success. The poison used is calcium arsenate, and it is applied by means of a power duster or hand-gun.

In 1918, some 35,000 acres of cotton were treated (see *Agricultural News*, Vol. XVIII, p. 122, April 19, 1919) with much success. The experts in charge of these trials, however, state that this work is in its experimental stage, and planters are advised either to take every precaution to make trial of it according to the best information available, and with due regard to the recommendations made, or to leave it alone altogether.

BRITISH GUIANA: REPORT ON THE DEPARTMENT OF SCIENCE AND AGRICULTURE FOR THE YEAR 1917.

This report, although not published until a few months ago, contains a large amount of useful information which is of permanent value to West Indian agriculture. At the beginning of the report Professor Harrison, C.M.G., the Director of Agriculture points out that the work of the Chemical Division has been seriously interfered with through depletion of staff. Nevertheless it was found possible to carry out a great deal of routine work in other directions, and also many agricultural investigations, the most important of which will be referred to in the course of this review.

Valuable experiments with sugar-cane were continued during the year. As regards routine work, 299,360 cuttings of forty-nine varieties were distributed to plantations, while in addition to the cuttings, 1,910 plants of new seedling varieties raised in 1916 were supplied in plant-baskets to plantations having nurseries. The most popular variety appears to be D.118. This variety in the experiments gave a high yield of cane per acre (33·1 tons), while its saccharose content was 1·95. The cane with the highest sugar content was D. 108, which tested 2·04 lb. per gallon.

In the manurial experiments increased manuring with sulphate of ammonia did not result favourably, although lower applications resulted in comparatively large increases. This was doubtless due to weather conditions. During 1917 sulphate of ammonia was very difficult to obtain, so the Department set out to find some form of manurial substitute. Great quantities of rice straw are produced in the Colony, almost all being wasted by rice farmers. For some years this straw has been used in the Botanic Gardens as a mulching material, and the results have been so good that the material has been recommended for use on estates in place of sulphate of ammonia. The beneficial effects of the rice straw are due to three causes: (1) its direct manurial action by the addition of nitrogen, phosphoric acid, lime, and potash to the soil; (2) its action in preventing the development of weeds, especially those of the order Gramineæ; and (3) by the large amount of difficultly decomposible woody fibre it adds to the soil, resulting in gradually rendering the surface soil lighter and less tenacious, and hence of better tilth. An application of 12 tons of rice straw to an acre, adds to the soil the following quantities of the more important constituents of plant food: nitrogen (Creole rice), 70lb. per acre; (No. 175) 94lb. per acre; phosphoric anhydride (Creole), 32lb., (No. 75) 32lb.; potash (Creole), 214lb.; (No. 75) 231lb.; lime (Creole), 38lb.; (No 75) 32lb. The dressings of rice straw produced the following excess yields: D. 625, 2·6 tons per acre, saccharose ·40 ton per acre; D. 118, 2·3 tons of cane per acre, saccharose ·46 ton; D.145, 3·4 tons of cane and ·43 ton of saccharose. From the results of these trials it is evident that it is worth the while of

a sugar planter to make large scale trials with any rice straw which may be produced on his estate, bearing carefully in mind that the full advantage of mulching with rice straw will not become apparent until repeated over several crops.

Several pages in the report deal with the special characteristics of certain seedling canes. It may be noted that a selfed seedling of D.145, namely D.748, had as high a saccharose content as 2·19lb. per gallon. The average yields in tons of commercial sugar per acre of the principal varieties under cultivation for the crop, of 1917 show that the first position is occupied by D. 419, which gave 2·15 tons of sugar per acre. The variety most widely cultivated, however, was D.625. This variety gave an average of 1·81 tons of sugar per acre.

Turning now to the section of the report dealing specially with rice, it is noticed that the return of the area under this crop for 1917 was 58,090 acres, an increase of 1,068 acres over that of 1916. A considerable amount of work was continued in the matter of selected varieties, and during the year upwards of 12 tons of seed paddy were sent out from the fields at the Gardens. The question of the influence of tillage upon the yields of rice irrigated by anaerobic artesian water received attention. Half the land under trial received two ploughings, at intervals of about five weeks, the other half being ploughed once only, just previous to the planting of rice. The results were striking. In the case of two ploughings the mean result was 27 19 paddy bags of 140 lb. per acre, against only 20·22 bags after one ploughing. Thus the additional ploughing or forking gives an increase of 34 per cent. on the crop. This is a very decisive result. It shows that irrigation with anaerobic, that is, air free, artesian water, to give full returns, must be accompanied by increased aeration of the soil.

In regard to coco-nuts, the area planted in the colony showed a further increase for the year under review. The total acreage under coco-nuts in 1917 was 23,872, an increase of 3,761 acres over that of 1916. A steadily increasing portion of the crop is being used for the production of oil for local purposes, and of copra for export. Nevertheless a large quantity of oil is exported. From the Botanic Gardens a considerable number of specially selected nuts were distributed for planting purposes. These nuts were of the following sorts : Singapore, Tobago, Trinidad, and local. In regard to rubber, some progress is reported in the production of this crop. Figures are given showing the rate of growth of the trees at Onderneeming, and these will no doubt prove interesting to rubber growers in other countries, and to persons with intentions to start rubber growing under British Guiana conditions. The area under coffee, which is chiefly of the Liberian kind, underwent an increase. The only crop of importance which showed a falling off was cacao. This industry in British Guiana is reported as being in a condition of stagnation.

A cultivation which is somewhat new to the colony is lime planting. A year or two ago a factory sowewhat similar to the St. Lucia Government Lime Juice Factory was installed, and this was expected to lend a measure of security to this young industry. It is stated in the report that the area under lime cultivation was extended by 4 acres during the year, bringing the total area to 44 acres, of which approximately 20 acres are in bearing. The trees growing on sand reefs, and on the lighter soils and higher lands may be described as flourishing, while those on the heavier and lower lands are suffering from various troubles.

Before concluding this review some mention must be made of the report on live stock in the Colony. During the year there was a general decrease in the numbers of all kinds of stock except cattle and donkeys, which showed increases. There was only one area which had to be declared infected during the year, and that was due to an outbreak of anthrax. There were not any cases in the Colony of glanders, cerebo-spinal meningitis, contagious pleuro-pneumonia, or mal-de-caderas during the year The Board of Agriculture's recommendation to import a thorough-bred stallion was approved by the Government, and the Combined Court voted a sum of $2,600 to cover the cost of purchase and importation and maintenance for one year of such an animal.

A SOLANACEOUS FORAGE PLANT.

An article in the *Journal of Heredity*, April 1919, draws attention to a possible forage plant for tropical or subtropical countries, which is new. The Solanaceae, the order to which many cultivated plants belong—such as the potato and tobacco—has not hitherto been supposed to afford useful forage for animals The author of the article referred to, Mr. B. H. Hunnicutt, M.S.A., Director of the Lavras Agricultural School, Brazil, draws attention to the possibilities, as a useful source of forage, of *Solanum bullatum*, a plant found wild in many parts of Brazil.

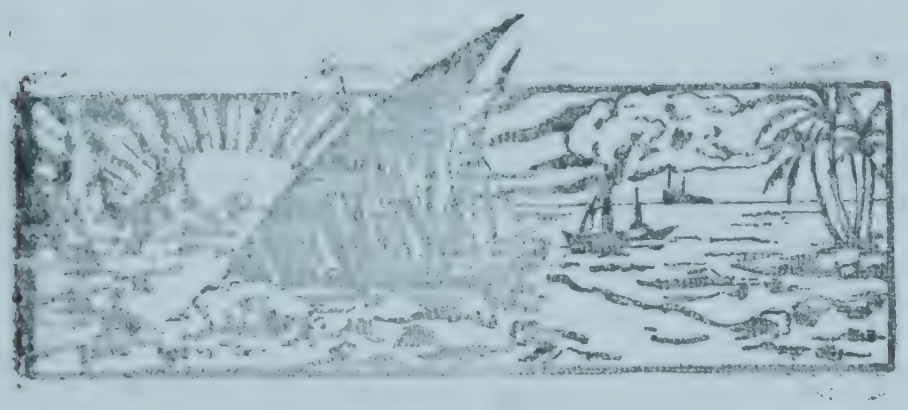
In Brazil it has many common names, differing in each State. In one locality it is known by the Portuguese name meaning 'white bush,' in another by that meaning 'dove fruit.' The first name is on account of the whitish tinge of the leaves; the second, because the wild doves are exceedingly fond of the fruit, so much so that it is not easy to collect ripe seeds, as the birds pick off the fruit before they are fully matured. In another part of Brazil the plant is known as 'wild tobacco' because of the resemblance of the young plant to the cultivated tobacco.

When the plant grows alone it tends to spread widely, but when plants grow close together, each one grows up as a single stem, sometimes from 15 to 20 feet high. When forest land is cleared in those parts of Brazil where *Solanum bullatum* is found, it is one of the shrubs that first appears as a secondary growth, the seeds having probably been widely distributed by birds which have devoured the fruit.

Horses and cattle are exceedingly fond of eating the leave. The writer of the article from which this note is abstracted says that one horse he owned could be safely ridden through a field of corn without his attempting to bite off a mouthful, but that it was difficult to get him past one of the 'white bushes,' until he had snatched a *bonne bouche*.

The plant is pernnial, but if grown as a forage plant it would probably be advisable to treat it as an annual, cutting the stalks down before they became too hard and woody. It might be worth while experimenting with this plant in other tropical countries, especially as the chemical analysis of the leaves, as given by the United States Department of Agriculture, shows that the protein content is as high as 20·88 per cent.

Another plant of the same genus, *Solanum grandiflorum*, which is also relished by cattle in Brazil, contains nearly 20 per cent. protein. This species is said to grow on much poorer land than *S. bullatum*. It resembles a giant egg-plant, and like the egg-plant has spines on the stems. It grows from 8 to 10 feet high, and is said to flourish on very poor clay land. This species also might be worth experimenting with in some parts of these islands, as for instance, on the poor clay lands in the centre of Antigua, or the district on the leeward coast of Dominica, in the neighbourhood of Batalie.



GLEANINGS.

The cultivation of limes does not appear to be making very good progress in Fiji, if one may judge from the remarks in the Report of the Department of Agriculture for the year 1917. The plots of lime trees at the experiment station have not grown particularly well, and those that have fruited have only given very light crops.

An ailment, caused by the consumption of vanilla in Guadeloupe and Réunion is referred to in *L'Agronomie Coloniale* for March-April 1919. Treatment of the external symptoms consists of emollient lotions and mucilaginous fomentations. The basis of treating the internal trouble is the administration of emollient infusions.

An interesting article on the manufacture of balata belting appears in the *India Rubber Journal* for May 24. That balata belting is better than rubber, leather, or even cotton belting for every purpose, is not true. Where water, acid, or acid fumes are present, it is however better than any other. Balata will not stand a high heat.

An interesting case of a fire on a plantation where the adjoining owners had to pay damages is reported in the *Indian Rubber Journal* for May 24, 1919. The lighting of a fire by a watchman in such a position as to permit its spread to a neighbouring estate possible, constituted, in the eyes of the court, criminal negligence.

According to the *Indian Trade Journal* for April 25, the recent Indian Cotton Committee is not very satisfied with the present position in India, in regard to cotton cultivation. They hint at the want of co-operation on the part of the small growers, and the appointment of a permanent central cotton committee for India is recommended.

Bermuda grass has been treated with sulphuric acid for periods varying from five to sixty minutes to test the effect of this treatment upon germination. According to *Physiological Abstracts* for May 1919, the lots treated for ten minutes gave the quickest germination ; 95 per cent. of the total germination was obtained at the end of the fourth day.

Really good progress was made in Jamaica between 1908 and 1914 in the matter of orange oil production. Since the war there has been some decline, but renewed anxiety, says the *Perfumery and Essential Oil Record* for June 1919, to increase the production, is now shown by the suggestion to adopt mechanical peelers and presses for extraction of the oil.

According to the *Journal of the Royal Society of Arts* for May 30, 1919, the yield of diamonds in German South-west Africa in 1913 was worth £2,698,500, or 20 per cent. in value of the entire output of the world.

The *Perfumery and Essential Oil Record* for June 24, 1919, says that a warning against the use of West Indian sandal wood oil has been issued by the Austrian Minister of Public Health : that official states the oil gives rise to dangerous secondary effects, owing to the presence of irritant terpenes.

The susceptibility of camels to certain diseases is the subject of *Bulletin No. 80* (1918), of the Agricultural Research Institute, Pusa. Camels were found to be as susceptible to blackquarter as cattle ; but camels were not found very susceptible to hæmorrhagic septicaemia. It appears also that camels develop severe lesions of rinderpest, and are more susceptible than some cattle to that disease.

A meal in which there is a deficiency of fat is lacking in staying power, even though that deficiency is made up in terms of energy by carbohydrates. It is pointed out in the *Experiment Station Record* for February 1919, that carbohydrates are very bulky, and are more subject than fat to fermentative changes in the intestines. Also, as pointed out in the last issue of the *Agricultural News*, animal fats contain important vitamines.

A heavy infestation of sugar-cane by nematodes was received last year by Dr. N. A Cobb, of the United States Department of Agriculture, from Florida. According to the *Experiment Station Record* for February 1919, one-half of the main roots of the stalks were dead, while of those alive, 45 per cent. were infested. While sugar-cane has been known to be a host for this nematode, such serious infestation does not seem to have been previously reported.

A note on new varieties of sugar-cane in Madras appears in the Agricultural Calendar of that State for 1919-20. It is stated that B.208 stands high manuring, yields a heavy outturn per acre, and has a long period of maturity. B. 1529 was found to be a heavy yielder, but matured a month or forty days earlier than B.208 or B.147. This last-named cane is stated to excel Red Mauritius in the matter of yield and milling quality.

All the varieties of maize used in some recent American experiments transpired more water per plant than the sorghums employed. The rate of transpiration per unit area of leaf surface, except in the case of the kafirs, was always much lower than that of the sorghums ; this difference was most marked under severe climatic conditions. The sorghums with their smaller leaf surface can keep their leaves better supplied with water than can the maize plants. (*Physiological Abstracts* for May 1919.)

The *International Sugar Journal* for June 1919, refers to a new rule for converting degrees Centigrade into degrees Fahrenheit. The calculation generally followed is to multiply by nine-fifths and add thirty-two ; and conversely, first to subtract thirty-two and multiply by five-ninths. A more convenient way is to add forty whether it is required to convert Fahrenheit or vice versa, multiply by five-ninths or nine-fifths as the case may be, and finally, in either case to subtract forty.

INDIAN CORN IN ST. VINCENT.

The following information appeared in Mr. W. N. Sands's Report on the Agricultural Department, St. Vincent, for 1917-18. It indicates striking progress in the matter of corn culture in this colony during the year under review :—

In last year's report it was shown that considerable progress had been made with corn growing since the outbreak of the war. A description of the Government Granary with its kiln-drier, machinery, and bins was also given. For the 1917-18 season still further progress has to be recorded. An account of the quantity of corn dealt with at the Granary, and other information of interest are given in previous pages. Excellent results were obtained by kiln-drying corn and storing it, so that it could be converted into corn meal for human consumption, at a period of the year when local food products were comparatively scarce and dear, and imports of foodstuffs were restricted. This action was much appreciated by the people of the colony.

The exports of the past five years were :—

Year.		Exports.	
1913	—	745	bushels
1914	—	766	,,
1915	—	1,518	,,
1916	—	1,652	,,
1917	—	2,855	,,

The exports are relatively small, but it is of interest to note that during the crop, 55 tons of corn were shipped to England, where it arrived safely, and secured prices satisfactory to the shipper. The bulk of the crop was, however, consumed locally.

Although a few fields with corn as the principal crop were cultivated, the bulk of the corn was grown as a catch crop with cotton and arrowroot, but more particularly with the former. The practice is to sow cotton and corn simultaneously, the corn being planted in each or every alternate row at a distance of 6 feet between the holes. The yield per acre is necessarily small, and, under good conditions, would hardly exceed 16 bushels and 8 bushels, respectively, of shelled corn per acre; still, even if 2,500 acres were grown each season in the manner described, and the average yield was 8 bushels per acre only, the total output from this source alone would be 20,000 bushels or 500 tons.

The arguments for and against intercropping corn with cotton need not be discussed here; but for the limited amount of shelter provided to cotton plants in early stages of growth, the interplanting of corn is undoubtedly prejudicial to the growth and bearing of the cotton, and especially so if the corn is planted in each row. This can readily be seen on estates when the cotton bolls are opening, and the pickers realize this fact so well that, in fields where corn has been sown in every alternate row, they will always strive to pick in the rows where no corn has been grown.

With arrowroot, corn is grown after the arrowroot has been reaped. The newly dug fields, principally those which are harvested in the last three months of the year, are sown with corn. Even wider distances of planting than those described above with cotton are adopted, and here again the yield per acre, although small, is an important addition collectively to the colony's output.

Although the usual method of corn production is in the form of a catch crop, yet it would be possible to obtain satisfactory yields by planting corn as a crop by itself. A large area of selected yellow corn has not been grown experimentally by the Agricultural Department, but experiments on small areas well cultivated and manured have indicated a yield up to 50 bushels per acre.

PLANT LEGISLATION IN ST. VINCENT.

The legislation in force regarding plant protection in St. Vincent consists of :—

(1) The Importation of Plant Diseases Prevention Ordinance, 1906.

Under Section 4 of this Ordinance the Governor-in-Council may by notice absolutely prohibit the importation, directly or indirectly, from any country or place, of any plants, packages, or other articles or things likely to be the means of introducing plant disease into this colony.

The following is a Schedule of the prohibition in force :—

'From all countries of Central and South America, and the islands of Cuba, Jamaica, and Trinidad. Of all coco-nuts in husk and all growing plants or parts of plants of coco-nut, or any earth or packing material associated with them, or any pruning knives, which have been used in the cultivation thereof.

'From Ceylon, Natal, South India, Mauritius, and the Straits Settlements. Of all plants, or trees, and any earth, soil, or vegetable matter used for packing or covering the same.

'From South America. Of all cacao plants or trees and parts or portions of such plants or trees, and any earth, soil, or vegetable matter used for packing or covering the same.

'From the Colony of Trinidad and Tobago. Of any suckers, roots, fruit, or any other portions of a banana plant, and any earth, soil, or vegetable matter used for packing or covering the same'

Section 5 provides for the fumigation and disinfection by the Agricultural Authority of all plants, packages, etc, imported.

(2) The Cotton Diseases Prevention Ordinance, 1911.

(3) The Cotton Diseases Prevention Ordinance, 1911, Amendment Ordinance, 1918.

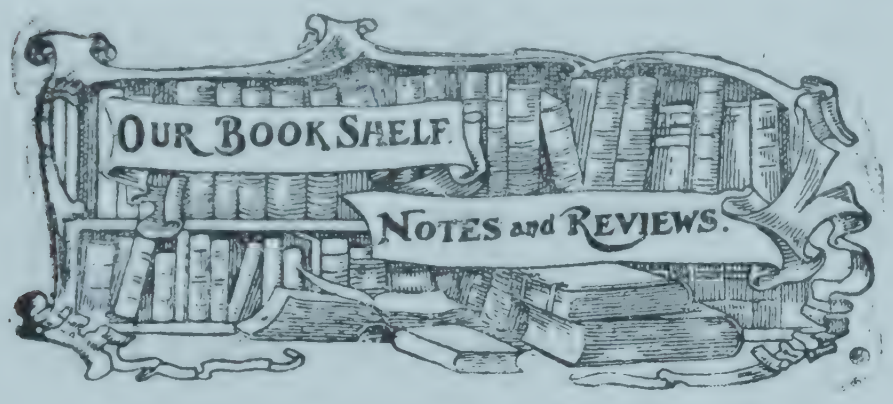
'For the definition of "Cotton Season" in section 2 of the Principal Ordinance, the following definition shall be substituted :—

'"Cotton Season" means such period as the Government may by Order-in-Council prescribe either for the whole of, or for a particular area of, that part of the Colony to which this Ordinance applies or may for the time being be applied, and, except in so far as such period is so prescribed, shall mean the period between the last day of April in any year and the first day of April in the succeeding year.'

In the supplementary Ordinance (5), Section 2 is as under :—

'The occupier of any building, in or in the neighbourhood of which the cotton stainer is present, who fails to take all such measures as may be necessary, for the destruction of such cotton stainer on becoming aware, or on being notified, of the presence of the same in or in the neighbourhood of such building, shall be liable on summary conviction to a fine not exceeding £20, or in default of payment, to be imprisoned with or without hard labour for a term not exceeding 6 months.'

(Report on the Agricultural Department, St. Vincent, for 1917-18).



THE CONTROL OF HOOKWORM DISEASE BY THE INTENSIVE METHOD. By H. H. Howard, M.D., New York City. The Rockefeller Foundation, International Health Board, 1919.

Dr. Howard, who is Director for the West Indies section of the hookworm campaign, describes in this booklet (issued as Publication No. 8 of the I. H. B.) the methods adopted, the organization, and the results so far achieved, regarding to this highly important work in the interest of human welfare. The publication is one that should be carefully read by West Indians, and particularly by those who by reason of personal prejudice or ignorance are anti-pathetic, or merely apathetic towards intensive treatment.

The author begins by pointing and that theoretically the treatment and eradication of hookworm disease should be a simple matter. There are few diseases which we understand more fully. There are no diseases where we have at least two certain specific remedies. The trouble lies in the personal element. People, particularly in tropical countries, fail to give perfect co-operation.

The intensive treatment of hookworm is an attempt to approximate complete relief and control within a certain definite area. Four things are essential: the inhabitants must submit to a census and to an examination; those found to be infected must submit to treatment; the people must also co-operate in the matter of preventing the hookworm eggs from getting into the soil : this latter point is largely a question of sanitation, the provision of public latrines.

The organization required in carrying out the extensive method of eradication is considerable. It needs a staff of microscopists and nurses all of whom can be locally trained men or woman. It also needs medical officers in charge, a clerical staff, and a staff of sanitary workers. In the St. Peters Hall destrict of British Guiana, the organization on the above lines was notably efficient, and indeed in all districts Dr. Howard is able to record most satisfactory results.

The table at page 122 shows the results in detail. To give an idea of what has been achieved, we may refer to the figures given for the whole of the West Indies. During the years 1914 to 1917 inclusive, 165,866 persons were examined for hookworm ; 97,632 were found to be infected ; 73,711 were cured ; 7,391 were removed from the areas dealt with : hence the number remaining uncured was 16,530, or only 16·9 per cent. of those infected. Of these uncured over six thousand refused treatment, and about five thousand were not treated for special medical reasons. The average cost per person examined, treated, and cured in this intensive work for the whole of the West Indies was $2·65—surely a trifling amount when one considers the enormous benefit derived by the individual, and by the colonies as a whole.

Before concluding this review, attention may be called to what Dr. Howard says regarding the specifics thymol and chenopodium. Dr Howard's experience is that thymol is a much better and safer remedy than chenopodium. Thymol is not so liable to produce toxic effects, and two doses usually effect a cure in eight days. At the time of taking thymol, the patient must abstain from food, and it is stated that the drug when mixed with an equal quantity of milk sugar is more efficacious than when administered by itself.

THYMOL *VERSUS* CHENOPODIUM FOR HOOKWORM DISEASE.

Both the Ajowan plant and Chenopodium, which produce thymol and wormseed oil, respectively, grow in the West Indies; hence the question as to which is the best specific against ankylostomiasis (hookworm disease), dealt with in the following article from the *Perfumery and Essential Oil Record* for May, will be studied with interest :—

A note in our last issue drew attention to steps in India to cultivate wormseed, and provide a local source of the oil for the treatment of miners' hookworm disease. The growing importance for this purpose of the oil, and, incidentally, its competition with thymol, is brought out in medical reports received from Fiji, Trinidad and Seychelles. These and other reports are evidence of a world-movement to tackle the disease, and as we write, a cable comes to hand from Sydney stating the trouble is being seriously investigated there. Seeing that two products of great importance in the essential oil world are involved, it is desirable that the experiments, observations, and deductions of the various medical Commissions engaged in the work should be recorded. In a campaign conducted by the Trinidad Commission, the drug most used was thymol, mixed with an equal weight of sodium bicarbonate, and finely powdered. It was given in two equal doses at 6 a.m. and 8 a.m., being preceded the night before and followed at 10 a.m. by a purge. The normal dose for an adult was 40 grms., with a maximum of 60 grms. Owing to children resenting the treatment, a preliminary aperient was abolished, and at 6 a.m. one minim of oil of chenopodium for each year of apparent age was given, and at the same time $\frac{1}{2}$-oz. of castor oil. The number of cases treated with chenopodium oil was very small against those with thymol, and this should be carefully borne in mind in interpreting the statistics of the work. Anyway, the report states that the oil of chenopodium proved only half as efficient as thymol in rendering the patient's stool free from ova of hookworms, but the chenopodium had the distinct advantage of removing *Ascaris lumbricoides* from a large number of the children treated with it. The reason for this very low efficiency of the oil of chenopodium in the treatment of ankylostomiasis is probably due to the unusally small dose administered, the medical Commission apparently being led to its adoption by some untoward experiences in earlier trials with this drug.

However, a very different account of the value of chenopodium oil comes from Fiji, where the authorities speak in the most unqualified praise of its efficiency. During 1917 oil of chenopodium was exclusively used in the treatment of ankylostome at the Tamanua hospital, where 1,818 cases were dealt with. 'There is no doubt whatever of the superiority of chenopodium oil compared with thymol, or any other drug hitherto tried. Chenopodium oil also possesses the additional value, in that it is a most potent destroyer of

the round worm, and is being used with the greatest success by the hospital superintendent for the treatment of worms among the horses owned by the Vancouver Fiji Sugar Company.' The Tamanua hospital find the most efficient method for treatment in doses of usually 15 minims in capsule at 5.30, 6.30 and 7.30 a.m., preceded and followed by an aperient with no food whatever during the period of the treatment. This is called the 'intensive' method, and 'one may be sure of obtaining a cure in 90 per cent. of patients after one treatment only. If the patients are kept very quiet lying down, there are no ill effects, such as giddiness or nausea (which only occur when the patient is allowed to move about or work). This method is most suitable for hospital use, where patients are under control and observation. In another method, the "Routine", for out-patients and for use on estates far away from their medical officer, the second capsule is omitted, but it is necessary to repeat this treatment several times according to the severity of the infection, before a cure can be obtained. In view of the Fiji medical authorities investigating the matter, there are many valid reasons why oil of chenopodium should supersede thymol as a vermifuge against anklylostome—it is less toxic, more efficient, not so costly, and has much greater effect upon the ascarides, which are so often associated with the hookworms.' The failure of some men to obtain good results with chenopodium, is attributed to the small dose employed, and the method of administration. A regular scale of doses has been drawn up for the first two treatments, viz, over sixty years of age, 20 minims; twenty one to sixty years of age, 30 minims; eleven to twenty years of age, 20 minims; under ten years of age, 3 drops for each year of age; pregnant women, 18 drops. The dosing is slightly increased for those not cured by two treatments. This dosage experience is based on the first thousand cures occurring in Fiji. It has been found that of those requiring two treatments, about 70 per cent. or more are cured. The view is expressed, that this percentage could be increased if the patients were more careful of their diet during the day of treatment; in a few well selected patients, obedient to advice, the cures after two treatments reached 85 per cent. Of the 1,000 cures obtained in the first three months of active work in Fiji, 801 occurred after two treatments, 184 after four, and the remaining 15 after five treatments.

The medical reports do not doubt that the percentage of cures after one treatment might practically reach 100 if the patients were under complete control, and the diet, the aperient, and the amount of the oil of chenopodium were properly adjusted. Of 3,088 infected persons found in Navua, 3,010. or 97·7 per cent., were treated; of these 2,794, or 92·8 per cent. were cured. The principal factor deterring those treated, but not cured, was removal from the area.

Since writing the above, an official report states that a campaign against ankylostomiasis was started in 1917 by Dr. J. F. Kendrick, in Seychelles, under the auspices of the International Health Board. By the end of the year treatment had been given to practically two-thirds of the population of the island of Mahé. The campaign is being most thoroughly conducted, and is being carried out by means of house-to-house visitation, all who are infected, being treated. It has been found that 90 per cent. of the people are infected, and the improvement, owing to the treatment, is clearly visible in the general health of the population. People of all classes have offered themselves for treatment with great keenness.

SALUBRITIES.

THE PATRON SAINT.

Chemical workers in all parts of the world will be gratified to learn that according to an American contemporary, *The Little Journal*, they are now provided with a patron saint. Our contemporary says:—

So far as we are aware, chemists have no patron saint and they surely need one. We propose St. Loy, who is known in ecclesiastical writings at St. Elegius, and to the French as St. Eloy. He was a goldsmith of Limoges, of great talent, and Clovis II made him master of the mint. He was very handsome, as chemists should be, and diligent, as they are these days, and wore fine apparel, as they do when they can. He practised austerities in secret, and chemists sometimes do this in their laboratories. He had great mechanical skill, which chemists often need The legend is told that once he was asked to shoe a vicious stallion that was brought to him, and as the men could not hold the animal, he took his trusty knife, and with one movement of his arm, severed the unshod leg from the horse's body. Then he adjusted the shoe to his satisfaction, while the stallion, having but three legs left, stood still. The work accomplished he set the leg back into its proper position, whereupon the beast trotted away cheerfully, without a sign of lameness. Versatility of this sort is occasionally needed in the adjustment of difficult laboratory apparatus.

THE FIRST ADVERTISEMENT.

The rainbow was the first great advertisement. It had position. It had colour. It held out a promise of benefit in effect: 'I shall not drown you again if you behave.' And then it had the value of repetition, because it is repeated in the same position and colour and promise after every rain.

The next big advertiser was Caesar when he wrote on the walls of Rome, for the people to read, just what the senators were doing in the senate chambers. These advertisments of old contained the elements necessary in all great advertiseing, which are:—

Advertising must be seen; it must be read; it must be understood; it must be believed; it must create a want.

Advertising is difficult because you must make the man stop thinking as he thinks and make him think as you think, and interest him in the thing you are interested in It is easy to interest a man in himself. If your advertising convinces him that it is good for himself, you have him sold. (From the *Kansas Industrialist.*)

A Temple of Agriculture.—A recent issue of the *Southern Planter* says that interest in the proposed Temple of Agriculture to be erected in Washington is growing. The National Board of Farm Organizations has the matter in charge, and the Farmers' Union brethren will undoubtedly hear from it in due course. It is presumed that one of the first uses of this temple, will be as a place in which to pray for rain.

At an opening session of the General Legislative Council of the Leeward Islands a high official described Antigua as a Presidency whose *needs* are greater than its *resources*. Dominica, perhaps, might be equally well described as an island whose *resources* are greater than its *needs*—except in the matter of roads.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, June 12.

BALATA—Venezuelan Block, no quotations; Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 122 6; Grenada, no quotations.
COPRA—£59.
HONEY—Jamaica, no quotations.
LIME JUICE—Raw, 2*s.* 7½*d.* to 3*s.*; Concentrated, no quotations.
PIMENTO—No quotations.
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD, May 27, 1919.

BAY OIL—Lower, at 13*s.* 6*d.* to 14*s.* 6*d.*
LIME OIL—Cheaper, at 4*s.* 6*d.* for West Indian distilled, and 12*s.* 9*d.* for hand-pressed.
ORANGE OIL—West Indian, No quotations.

Barbados.—Messrs. T. S. GARRAWAY & Co., July 22.

ARROWROOT—$8·60 per 100 lb.
CACAO—$20·00 to $21·00 per 100 lb.
COCO-NUTS—$36·00 husked nuts.
HAY—$4·50 to $4·75 per 100 lb.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations
SUGAR—White Crystals—$8·00.

Trinidad.—Messrs. GORDON, GRANT & Co., July 4.

CACAO—Venezuelan, $26·00; Trinidad, $24·50.
COCO-NUT OIL—No quotations.
COFFEE—Venezuelan, 20c. per lb..
COPRA—$9·00 per 100 lb.
DHAL—$10·50.
ONIONS—$9·00 to $9·25 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $5·00 per 100 lb.
RICE—Yellow, $12·00; to $13·00 White, $12·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., July 3.

CACAO—Caracas, 25½c.; Grenada, 24½c. to 24¾c.; Trinidad, 24¾c. to 25c.; Jamaica, 18¾c.
COCO-NUTS—Jamaica selects, $66·00; Trinidad $66·00 culls, $48·00 per M.
COFFEE—Jamaica, 24c. to 26½c. per lb.
GINGER—16c. to 19c. per lb.
GOAT SKINS—Jamaica $1·50; Antigua and Barbados, $1·50; St. Thomas and St. Kitts, $1·50.
GRAPE FRUIT—Jamaica, $3·50 to $4·00.
LIMES—$6·00 to $8·00.
MACE—40c. to 41c. per lb.
NUTMEGS—19c.
ORANGES—$3·50 to $4·00.
PIMENTO—8¾c. per lb.
SUGAR—Centrifugals, 96°, 7·28c; Muscovados, 89°, 6·00c. Molasses, 89°, 5·715c. all duty paid.

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A FORTNIGHTLY REVIEW

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CONTENTS.

	PAGE.
Agricultural Credit Societies in St. Lucia ...	246
Agricultural Credit Societies in Trinidad ...	249
Anderson Oil Expeller in the Federated Malay States	255
Brimstone Tree of Sierra Leone	248
British Cotton Growers' Association	249
Cacao, Criollo	249
Cacao, Criollo, Is it Disappearing?	244
Cacao on the Gold Coast, Behaviour of, ...	245
Department News ...	246
Gleanings	252
Havana, Botanic Garden at	251
Insect Notes :—	
Notes on Some Insect Pests in Costa Rica	250
Items of Local Interest	253
Jute Cultivation in Brazil, Prospects of	246
Legume, In Praise of the	247
Market Reports	256
Milk, Sanitary Production of, ...	251
Notes and Comments ...	248
Porto Rico, Promising Crop for, ...	245
School, Floating, A ...	248
Soils, Heated, Influence of, on Growth	249
Sugar, Virtues of	243
Sugar-cane, Introduction of into the West Indies	242
Sugar Content of Central Factory Canes, Decline in	241
Sugar Industry, Cost of Production in the ...	248
Tractors, Employment of	247
Vegetable Oils, Demand for	243
West Indian Products ...	253
Wither-tip of Limes in Trinidad, The	254

Decline in Sugar Content of Central Factory Canes.

THE article by Sir Francis Watts* on the sucrose content of canes in Antigua and St. Kitts has aroused considerable interest there. In this article, by means of a careful analysis of past records, two facts are demonstrated. It is shown first, that whereas the sucrose content of canes grown on the estate experiment plots has fluctuated about a mean, there has been no steady deterioration. In other words, the varieties of sugar-cane in general cultivation have not in themselves deteriorated. The second fact demonstrated by the analysis, however, is less satisfactory, for a study of the figures given by Sir Francis Watts shows that there has been a slow but steady decline in the sucrose content of the same varieties of cane ground at the Antigua and St. Kitts Central Factories.

Sir Francis Watts attributes this falling off which is admitted by both Factory authorities, to several causes. One of the principal reasons is believed to be connected with inferior cutting of the cane on the estates which supply the Factories. In the old muscovado days, the planter was careful to remove the immature tops and to discard inferior canes because he knew that neglect to do so would spoil his sugar. But with the advent of the Central Factory system, in which the planter sells his cane by weight, and the Factory bears the entire responsibility of manufacturing sugar, there is not only less inducement for the planter to be careful, but also some considerable temptation for him to supply as much cane as he possibly can, irrespective of its quality and its treatment.

Another—perhaps the chief—reason for the decline in sucrose content is the delay that occurs between cutting and grinding. In Antigua this is very considerable during the week-ends.

In discussing the conclusions of Sir Francis Watts, the Antigua Sugar Factory, Ltd.† expresses similar views, but in rather more detail. In Antigua they

* *West Indian Bulletin*, Vol. XVII, No. 3, (April 1919).

† L. T. Henzell in the *Louisiana Planter* for June 21, 1919.

have found the cane supplied for grinding to carry a large amount of top and roots; also there is always a fair proportion of unripe cane, due largely to the Factory having to start operations early—i.e., in February. Then again, there is always a certain amount of 'stand-over' cane, which estates having their own small factories have been unable to grind themselves. Another cause is connected with stale cane. In Antigua, Monday is a holiday, so that cane for supplying the Central Factory on Monday and Tuesday is possibly cut on Thursday and Friday. This causes much deterioration.

The views of the St. Kitts (Basseterre) Central Factory Staff, which have recently been supplied, are equally directed against the estates. Decline in sucrose content is partly caused by late planting with inferior cuttings. Estates are said to be unwilling to sacrifice for planting, good canes which they can sell to the Factory. Inferior cane plants require a large number of supplies, and as this supplying is carried on to the end of June, many of the supplies are five or six months younger than the original plants. This leads to a great deterioration of the juice. In this connexion the establishment of estate nurseries is advocated. The opinion is expressed that late planting is the result of the practice of growing cotton as a catch crop which largely tends to throw the system of cane planting for Central Factory supply, out of gear. The St. Kitts Factory Staff is of opinion that the canes are cut no worse now than they were in the early days of the Factory.

In summing up the position, it is only fair to bear in mind that the evidence of the planters has not been taken in this discussion. But while the planter may be able to show that the decline in sucrose is due to reasons other than those stated above, it is more probable that he can do little more than furnish excuses. Questions of labour difficulty may be cited. In Antigua we know there have been labour troubles, and this may furnish explanations for some of the complaints put forward by the Antigua Factory. The new custom on estates of keeping Monday as a holiday is very unreasonable, and it is hoped that the system of giving bonuses to those who are willing to work may gradually cause this custom to disappear.

While considering the subject of this article from the planters' point of view, it might be mentioned that someone has suggested that the increased efficiency of the mill work in the central factories has resulted in lower purity of juice, especially in Antigua where the rind of the cane is so thick. Another suggestion is that the cultivation of the woody Uba cane on the Factory estates in Antigua, has tended to lower the average sucrose content of the canes ground at the Factory.

It is clear that the whole subject is one that should be dealt with in conference by planters and factory authorities. This could be conducted in a perfectly friendly spirit for it is in the interests of all concerned that any falling off in efficiency shall be remedied. No doubt the matter has by now received the consideration of the Agricultural Societies immediately concerned. Information, however, does not indicate that very great efforts are being made by estates to deal with the matter in Antigua. If this is true, it is to be regretted, for it must be clear to everyone, that the decline in sucrose content of canes at the Central Factories raises a big and important question: and that is—Should cane be paid for according to sucrose content, instead of by weight ?

INTRODUCTION OF THE SUGAR-CANE INTO THE WEST INDIES.

The following article which was published in the *Agricultural News*, Vol. VI, p. 115, is reproduced, in view of its interest, for the benefit of the present day readers of this Journal :—

In the *Agricultural News* (Vol. VI, p. 35) reference is made to the history of the sugar-cane in the West Indies; and it was pointed out that the native home of the sugar-cane should probably be looked for in the East and the Pacific Islands, and that there is every probability that the sugar-cane was brought to the West Indies in or about 1520 by Columbus.

Washington Irving in his 'Life and Voyages of Christopher Columbus', (London : George Bell & Sons, 1890), makes no mention of the sugar-cane being found upon the islands discovered during the first voyage, but it is on record that in fitting out for his second voyage in 1493, Columbus made arrangements so that 'Grain, seeds of various plants, vines, *sugar-canes*, grafts and saplings were embarked together with a great quantity of merchandise . . . . . calculated for trafficking with the natives. . .'

In about the middle of December 1493, the founding of the city of Isabella (in Hispaniola) with the planting of orchards and gardens, led to the emptying of most of the ships, for it is stated that 'the ships having discharged their cargoes, it was necessary to send the greater part of them back to Spain.' Twelve of the ships were sent home early in 1494, and by these ships Columbus sent despatches to Spain describing 'the quick fecundity of the soil, evinced in the luxuriant growth of the *sugar-cane*, and of various grains and vegetables *brought from Europe*'; and on March 29, 1494, he found on return to Isabella from an expedition into the interior, that 'the plants and fruits of the Old World which he was endeavouring to introduce

into the island, gave promise of rapid increase,' and that '*the sugar-cane* had prospered exceedingly.'

From the above and other information of a corroborative character, it would appear (1) that the sugar-cane was not indigenous to the West Indies; (2) that it was introduced into the West Indies by Columbus on his second voyage. It is probable therefore that the date 1493 should be accepted as the date of its introduction—not 1520 as previously mentioned.

THE VIRTUES OF SUGAR.

Richard Ligon, in his famous 'History of the Island of Barbados', Published in London in 1657, and dedicated to Dr. Brian Duppa, Lord Bishop of Salisburie has naturally much to say concerning sugar, which was even then as to-day the great topic of interest and conversation in the island. Referring to his lengthy account of the primitive methods then in vogue. Ligon, addressing the Lord Bishop says: 'So having played you a short Preludium to this long and tedious lesson of Sugar and Sugar-making, I do think fit to give you a Saraband with my best Touches at last; which shall be only this, that as this plant has a faculty to preserve all fruits that grow in the world, from corruption and putrefaction; so it has a virtue, being rightly applyed to preserve us men in our healths and fortunes too. Doctor Butler, one of the most learned and famous Physicians that this Nation or the world ever bred was wont to say that,

'If Sugar can preserve both Peares and Plumbs,
Why can it not preserve as well our Lungs?'

'And that it might work the same effect on himself, he always dranke in his Claret wine, great store of the best refin'd sugar, and also prescribed it several ways to his Patients, for Colds, Coughs, and Catarrs; which are diseases, that reign much in cold Climates, especially in islands, where the Ayre is moyster than in Continents; and so much for our health.

'Now for fortunes, they are not only preserved, but made by the powerful operation of this plant'.

Ligon then goes on to quote the remarks of several planters of that time, one of whom told Ligon that 'he would not set his face for England, till he made his voyage and employment there worth him a hundred thousand pounds Sterling.' This seemed to be quite a moderate accumulation for planters in those days, as it is for some of them now—nearly 300 years after.

THE DEMAND FOR VEGETABLE OILS.

Few people even yet realize the immense importance of vegetable oils in the industries of northern countries. On it the stability of the coco-nut and similar industries rests. In a recently issued Bulletin (No. 769, Bureau of Chemistry) United States Department of Agriculture, the subject is fully dealt with. In the summary this Bulletin says:—

Vegetable oils are being used in ever-increasing amounts to supplement the animal fats and oils. Some, like cotton-seed oil, make a satisfactory substitute for part at least of the animal fats in such products as lard, while some of the less well known vegetable oils, like peanut and corn, are rapidly growing in public favour as substitutes for olive oil, which has recently been very difficult to obtain. It has also been found possible to conserve our supply of linseed oil by using tung and similar oils in making paint, varnishes, and other technical products. It is believed that the manufacturer of vegetable oils may practise many more economies than he now does, thus eliminating certain sources of waste.

The recently devised hydrogenation process has made it possible to secure a very satisfactory lard compound, in which a vegetable oil replaces all of the often more expensive animal fat. By means of this same process, various fish oils now employed only for technical purposes may be rendered edible.

Concerning coco-nut oil, an important West Indian product, the Bulletin says:—

For many years we, as a nation, have been using coco-nut oil in the manufacture of the so-called marine soaps, that is, those which form a lather in alkali and salt waters, to make pharmaceutical preparations, cosmetics, and, to a smaller extent, confectionery and cakes. It is only within the last five or six years that this oil has received the attention which it deserves as a food product.

The rapid increase in coco-nut oil importations, from 46,720,000 lb. for the year 1912, to 163,091,000 lb. during 1917, is due partly to the fact that larger amounts of this oil are now used in the soap industry than ever before. Coco-nut oil yields a higher percentage of glycerine than any of the other soap fats, and it can be substituted to some extent for tallows, the price of which was abnormally high during 1917. Reports from the soap trade indicate a consumption of coco-nut oil during 1917 of 168,602,000 lb. which is 5,500,000 lb. more than the total imports for the same period. To furnish the additional oil used by the manufacturers of vegetable butter substitutes and other industries, at least 10 copra-crushing mills are now operating in the United States. The 1917 output of the crushers was nearly 188,500,000 lb., which is about 26,400,000 lb. greater than the amount of coco-nut oil imported. To supply these mills it was necessary to bring in from the Orient and the West Indies, in 1917, 366,700,000 lb. of dried coco-nut meat, known commercially as copra. During 1912 the importations of copra were only 62,168,000 lb., about one-sixth of the amount imported in 1917, in spite of the difficulties experienced in getting sufficient ships for our overseas trade. In the fiscal year 1913, we brought in a little over 1,000,000 lb. of coco-nut oil from the Philippines, and in 1916 over 30,000,000 lb, nearly half of our entire importation for that period.

The absence of German buyers from the foreign copra markets caused an increase in the amount of coco-nut oil produced in the United States, during the past five years. Although the difficulty in obtaining ships to bring the copra from the tropics has resulted in lowering the price of this product in the countries where it is produced, the domestic price for coco-nut oil has increased. At present a comparatively small amount of the world's supply of copra is going to Germany, England, and Holland, very large importers before the war began, and much of it has been diverted to American manufacturers. This, to some extent, has helped to keep the price of coco-nut oil from reaching the high figure it might otherwise have attained, because of our greatly increased domestic consumption.

IS CRIOLLO CACAO DISAPPEARING?

In an article by Mr. A. W. Knapp, entitled 'Science in Cacao Production', which was partly reproduced in the *Agricultural News* (No. 444, p. 141), the writer comments upon the difference in market prices of cacao, owing to the varying quality of the beans from different countries. He states that it is owing to this fact the British Food Controller fixed the price of West African cacao at 65*s*. a cwt., Grenada at 85*s*. a cwt., and Ceylon at 100*s*. a cwt. It is further stated that 'the quality of any cacao is the result of the botanic variety or "breed" plus the treatment it receives in preparation for the market. Now Grenada and Ceylon cacaos are obviously different in "breed," so that Grenada cannot hope by fermentation, however scientific, to get the Ceylon bean. The line of improvement, perhaps for Grenada, is to try the planting and rearing of the more delicate Ceylon type of cacao.'

There is evidently a doubt in the writer's mind when he makes the guarded suggestion to Grenada planters to grow a delicate variety of cacao; and very many planters in the West Indies will share that doubt with him.

It is not the object of this article to discuss cacao growing in Grenada though the maintenance and development of the industry there, combined with comparative freedom of disease, have been remarkable—a state of things presumably due to the growing of varieties of cacao suited to the climatic conditions. It is rather our object to point out the need of collating information on what has happened in various countries during the initial efforts to cultivate and establish cacao plantations. Such a record, if made, would be of the greatest value to those who have from time to time to discuss the cacao situation. It would also serve to assist planters in any efforts that may be made in the future to grow cacao in new localities.

In the early days of cacao growing in the West Indies, during which the delicate Criollo cacao was the variety used, it is recorded by historians that in Trinidad, Jamaica and Martinique, the trees were destroyed by a 'blast'. This 'blast' is held by some to mean the effects of a hurricane; by others, to be due to the same fungus disease which to-day exacts such a heavy toll amongst criollo trees. Probably the latter view is correct. It is unlikely that cacao cultivation was destroyed by a hurricane in Trinidad, or that wholesale destruction from this cause occurred in either Martinique or Jamaica.

When cacao cultivation was again taken up in those countries, the varieties imported and grown were the hardier Forastero kinds. It is apparent to all who have studied the growing of cacao, that this replacement of the high grade Criollo by the lower grade Forastero is a natural process in nearly all cacao-growing countries. Whenever cacao is taken up by planters, it is generally the desire to plant the best type, that is, the Criollo variety, which though delicate in constitution and very prone to disease, commands a high price on the market. But no sooner is a field of this variety established in the smaller West Indian islands than it begins to die away, owing to its delicate character, and its liability to canker and other disease. This leads to its replacement by the hardy Forastero varieties. In gaining this experience, the planter has lost greatly in time and in pocket.

Twenty-five to thirty years ago, when a good deal of attention was being paid to cacao-growing in Dominica, the same mistake was made, and thousands of pods of Criollo cacao were imported for raising plants. It may be said that very few of these are alive to-day, and those which survive are located in very favourable situations. The same efforts have been made and the same experience has been reported from other countries. According to van Hall, even in the basin of the Orinoco, probably the home of Criollo cacao, planters are now growing the best kinds of Forastero in place of the Criollo variety.

All this means that the production of high grade cacao is falling off, while that of inferior cacaos is growing. It is somewhat surprising to find that on rich and well favoured lands near the Equator, the planter is now doing what the peasant proprietor has long done in islands like Grenada and Dominica, i.e., insisting on growing the varieties which are hardy, long-lived, and free bearers. For this action the peasant has been vigorously rated in the past; but the results of his work are sound, and it is probably owing to this early appreciation of the difficulties connected with cacao cultivation in the small islands of the West Indies, that the cacao situation is so strong in Grenada to-day.

It is evident from actual experience, that countries lying within 10° or 12° north or south of the Equator, are better suited for Criollo cacao than those lying outside those limits, but within the tropics. The success of cacao cultivation in islands like Dominica, St. Lucia and Grenada is clearly conditional on the hardy and long-lived varieties being grown. That being so, all advice to grow delicate varieties in these islands is in direct opposition to local experience, which has in many cases been gained at great cost and effort.

If the present trend to substitute Forastero varieties for Criollo continues in countries which formerly were noted for the excellence of their Criollo cacao, the time will arrive when the latter will disappear from the world's markets. According to van Hall, even in those districts in countries near the Equator which were once famous for high grade cacao, the produce shows steady deterioration during recent years, owing to interplanting with Forastero varieties. It would be interesting to know if there is any parallel case of an extremely fine product gradually ceasing to be cultivated, owing to disinclination of the growers, even in favoured situations, to take the necessary pains to produce it. The manufacturers certainly want the product; but will they pay a price which will recoup the grower the high cost of producing the article, in order to keep the variety under cultivation, and the produce available for commerce?

It would appear that the Criollo variety, in spite of all its constitutional defects, could continue to be successfully cultivated in favourable situations by adopting intensive methods of cultivation, which would include periodical spraying of the plantations to keep down fungus diseases, to which this cacao is particularly susceptible. But the cost of such procedure would be considerably in excess of that now incurred on plantations, and it would follow that planters forwarding that product to market would require a much higher price over and above the ruling prices which the best Forastero kinds fetch to-day.

The great requirement of the present is an exact record of what has happened and is happening in cacao-growing countries in respect to this important matter. Such information would be of the greatest value to all interested in the production of cacao. The one outstanding fact in regard to Criollo cacao, a highly prized product, is that all attempts to grow it commercially have, in the long run, owing to various reasons ended or are ending in the defeat of the planter, who has in the past and is at present being compelled by a variety of circumstances to depend more and more upon the hardier varieties.

THE BEHAVIOUR OF CACAO ON THE GOLD COAST.

Some instructive information concerning the behaviour of different varieties of cacao on the Gold Coast is given in the Report on the Agricultural Department of that colony for the year 1917. For the information of those readers who are not familiar with cacao cultivation, it may be pointed out that varieties of cacao are roughly divided into two classes: (1) Criollo, and (2) Forastero. As will be gathered from an article on Criollo in the present issue of the *Agricultural News*, the first class is of a higher quality but less hardy than the Forastero. This last-named class comprises a much larger variety of types, and includes several well-known ones like Cundeamor, Ocumare, and Amelonado. In the report under consideration, the behaviour of these types at the different experiment stations on the Gold Coast are described. At Aburi, the Cundeamor variety is reported on as giving 46·13 pods a tree in 1917 as against 39·95 pods per tree in 1916. It required an average of 10·43 pods to make 1 lb. of cacao, and the average yield of dried cacao per tree was 4·14 lb. Concerning Ocumare variety, the total number of fruiting trees was 32, and the total pods collected was 1,067 making an average per tree of 35·34 pods against 15·24 pods in 1916. The average number of pods required to make 1 lb. of dried cacao was 13·22, and the average yield of dried cacao per tree was 2·21 lb. As regards Criollo, both the red and yellow forms, the total number of fruiting trees was 89, and the number of pods gathered 2,152, making an average per tree of 24·18. The average number of pods required to make 1 lb. of cacao was 16·97 and the average yield of dried cacao per tree was 1·38 lb. It is stated that insect attack contributed largely to the smallness of the pods. A table is given to show the susceptibility of each variety to diseases and pests. This table is very instructive, and the percentages of affected pods for each variety are as follows : Amelonado 54·60 per cent., Ocumare 52·95 per cent., Cundeamor 59·74 per cent, Criollo 73·79 per cent.

At the Coomassie Experiment Station it is stated that the trees of all varieties, especially the green Criollo have made considerable progress though it is also reported that certain insect pests caused considerable trouble, 'especially in the Criollo varieties'. A table is given showing the number of diseased pods from different varieties at the station, and we have calculated the approximate percentages to be as follows : Amelonado 4 per cent., Cundeamor 6 per cent., Ocumare 5 per cent., Green Criollo 4 per cent., Red Criollo 6 per cent

The remarkably low percentage of infested pods at the Coomassie Station compared with the percentages given for the Aburi Station will be noticed. The report offers no explanation. It will also be noticed that at Coomassie the Criollo types appear to be no more susceptible than the Forastero

A PROMISING CROP FOR PORTO RICO.

Up to quite recently, species of vanilla of economic value were almost unknown in Porto Rico ; according to *Bulletin 26, of the Porto Rico Experiment Station*, vanilla is now regarded as one of the promising new crops. The following is the summary to this Bulletin prepared by T. B. McClelland :—

In spite of conditions admirably adapted for the production of vanilla the crop has never been grown commercially in Porto Rico.

While the price of vanilla is not what it formerly was the consumption has increased greatly.

An import duty into the United States of 30 cents a pound means an advantage of exactly that amount for vanilla grown in Porto Rico.

Extract made from beans grown locally has been pronounced of excellent quality. From the reports of dealers to whom beans have been sold or samples submitted, this vanilla is worth from $2 to $4 a pound under the market conditions of the last two or three seasons.

From a small plat the crop (which was marketed at less than four years from the time the cuttings were set) averaged about one-third pound cured beans per fruiting vine. The gross returns from the sale of this crop were at the rate of a little less than $400 per acre. The year following, the yield averaged more than one-half pound cured beans per vine. This crop was not sold, but from valuations placed on samples submitted to vanilla dealers it would have yielded gross returns at the rate of approximately $700 to $900 per acre. The crop of the following year from these and younger vines on a one-tenth acre plat amounted to 36·44 pounds and sold for $109·31.

In starting a vanillery, the land should first be cleared and then planted with the trees which are to support the vanilla vines.

The dwarf bucare (*Erythrina corallodendron*) has proved well adapted for this purpose, and it is easily propagated from cuttings.

On steeply sloping land the rows should run with the contour lines of the slope and should be terraced in order to retain a mulch around the vines, as vanilla roots grow much better in a leaf mulch than in soil alone, and the maintenance of a good mulch of decaying vegetable matter is important.

Long cuttings make much more rapid growth and come into production sooner than short ones.

The shade trees must be pruned to avoid too dense a shade, which is detrimental to the development of the vines. A light shade admitting checkered sunlight is preferable to full exposure to the sun.

The rapid growth of the succulent brittle vines demands frequent attention from the planter to keep them in proper shade and within easy reach for pollinating.

Hand-pollination must be used with vanilla. The number of blossoms pollinated has a most pronounced effect on the size of the beans. The pollinator may choose between a limited number of handsome, well-developed beans and a larger number of short, inferior, poorly developed ones, since, the blossoms are generally produced greatly in excess of the number of beans which the plant is able to develop properly.

Labour for pollination is needed principally in March and April : for picking the crop from September or October to January ; and for curing and preparation for market from picking time to late spring.

As the various operations require a considerable expenditure of time, care and money, anyone who is unwilling or unable to give the requisite attention to this crop should not attempt its production. Under proper management, however, it should prove highly profitable.

The small bulk and imperishability of the finished product commend vanilla culture, particularly for such districts as are accessible only by poor roads over which bulky and more perishable produce cannot be carried.

THE AGRICULTURAL CREDIT SOCIETIES IN ST. LUCIA.

The Annual Report on the working of the Agricultural Credit Societies of St. Lucia has been published in the *Official Gazette* of the colony for June 14.

The working of these Societies in St. Lucia is yet in its infancy, operations having started about three years ago, and judging from the report there is a very hopeful future for the enterprize. We are strong on the point that if the colony is to become prosperous the peasants must be solidly helped to lift themselves out of the old rut.

The Report states that there were 419 members compared with 347 at the close of the previous year, and that the amount of loans due to the Colonial Bank by the Societies on March 31, 1919, was £2,420, an increase of £1,189 on the previous year. If with this sum at their command the peasants have endeavoured to improve their cultivated areas or cleared lands for planting up fresh crops, particularly sugar-cane then we conclude it has been money well spent, and cannot fail to benefit the community, the peasants themselves included. Interest is charged by the Colonial Bank at the rate of 7 per cent.

Produce shipped during the year included Cocoa, Kola and Sugar. In the case of Micoud, sales had not yet been effected at the time the report was written, and the sales account for cocoa shipped from Dennery had not been yet received. Excepting these two instances, the total amount realized for the produce shipped by the Societies was £151 0*s.* 5*d.* while the cocoa sold locally fetched £119 0*s.* 3*d.*

A statement is made in the report that there is an almost complete absence of loans being applied for such purposes as christenings, marriages, funerals, etc. We are pleased that an eye is being kept on this matter and have no doubt that with continued attention by the officers concerned as well as with increased prosperity among the peasants little or nothing will soon be heard of on this particular point.

There was no increase in the number of societies, which is ten; and since there is already one in each agricultural centre of the island it is a good idea that the number should not be increased but that attention be paid to the full development of those already established.

About a year ago we drew attention to the fact that there were small proprietors who could not be benefitted by the help afforded by the Agricultural Societies, and it is pleasing to note that the Agricultural Superintendent in his letter accompanying the Report has not lost sight of the point, and we desire to urge all possible speed in providing for these cultivators assistance on similar lines as those afforded through the Agricultural Credit Societies. (The *Voice of St. Lucia*, June 21, 1919.)

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the department, is expected to leave Barbados by S.S. 'Parima' on or about August 14, for St. Lucia, for the purpose of conducting investigations in that Colony.

Mr. S. C. Harland, B.Sc., Assistant for Cotton Research, arrived at Barbados on August 4 by C.R.M.S. 'Caraquet' from St Vincent *en route* for the Leeward Islands for the purpose of conducting investigations there. It is expected he will return to St. Vincent in about six weeks time.

PROSPECTS OF JUTE CULTIVATION IN BRAZIL.

The heavy cost of raw jute imported from India during the war, and the consequently high price of hessians, has caused the question of the possibility of the cultivation of jute in Brazil to be extensively ventilated in the Brazilian press.

As a result of the publicity given to the matter, the Minister of Agriculture despatched two emissaries to India to study the possibilities of this question, and on their return they have made public the result of their investigations.

After an exhaustive analysis of the climatic and labour conditions, one of the emissaries is very emphatic in his opinion that the cultivation of jute in Brazil on a profitable scale is impracticable. In support of this view he cites the fact that the Government of Egypt, which possesses identical lands to the alluvial basins of the Ganges and the Brahmapootra, failed to establish jute in Egypt. He further quotes the example of the United States and shows that, in both of these countries the cultivation of jute was finally abandoned in favour of cotton.

He proceeds with his exposition by stating that the climatic conditions are not, however, the principal factors in the formation of his opinion. He points out that the cultivation of jute calls for the employment of a large quantity of manual labour, and he attributes the failure of the cultivation in the United States to the absolute necessity of cutting and separating the fibres by hand—an operation which has to be carried on often with water to the waist, and calls for a highly skilled and practised labourer. He further pays a high tribute to the excellent system of communication, in India, whether by rail, water, or road, as an important factor in jute cultivation, and which Brazil entirely fails to possess.

The second emissary, on the other hand, has returned with far more hopeful views on the subject. He extended his tour to Cuba, and from his personal observation is convinced that the machine in use there for separating the fibres, satisfactorily solves the labour problem (which has always been considered the objection to cultivation in Brazil). He points out that the price of unskilled labour is 6*s.* per day in Cuba, owing to the great demand from the sugar plantations—a price which is even higher than in Brazil. He further endeavours to destroy the generally accepted opinion that jute can only be cultivated on low-lying alluvial lands, and states that in Cuba he saw excellent jute plantations on land which had been previously under sugar. (*The Board of Trade Journal* for May 8, 1919.)

It is stated in the *India Rubber Journal* for May 1, that Dr. Arens has recently made a number of experiments to find out whether drip tins filled with water and placed on rubber trees help to keep the latex vessels open and reduce the amount of scrap rubber. The results do not appear to justify the expense and labour involved in adopting the system.

A recent circular states that a big shipping, engineering and machinery exhibition is to be opened at Olympia, London, on September 25 next. This exhibition, of which Sir Owen Philipps, G.C.M.G., M.P., is Honorary President will afford the public an opportunity of becoming acquainted with 'the luxury, comfort and ease of present day sea travel.' We presume that the term 'ease' is not used in reference to present day facilities in obtaining passages.

IN PRAISE OF THE LEGUME.

Although the reason why leguminous plants enrich the soil was not understood until the publication of Hellriegel and Wilfarths' famous paper in 1888, the practice of using these plants for soil improvement dates a long way back—as far as the earliest days of agriculture. In a paper on Soil Making, read before the Royal Horticultural Society of England last year, Dr. E. J. Russell, F.R.S., gave some interesting quotations from the Ancient and Middle Age literature, which show beyond question that clover and other temperate leguminous crops were highly appreciated, and cultivated with the direct object of enriching the soil. Thus Theophrastus, writing 300 years before Christ, says that in Macedonia and Thessaly beans were grown to be ploughed in at flowering time. Varro, about 50 B.C., says, 'Some things should be sown with a view not so much to present profit as to next year's crop, because when cut down and left they improve the soil. Thus, lupins before they produce many pods, and sometimes beanstalks, if the podding stage be not so far advanced that it is profitable to pull the beans, are usually ploughed into poor land for manure'.

The beneficial effect of the above crop has been known from early times, and was a great feature in the husbandry of Flanders, which has always been a model for the rest of Europe to follow. Some of the English older writers on the value of clover were very enthusiastic and quaint. Thus Yaranton who, in 1663, declared that being ploughed it will yield three or four years together a crop of wheat, and after that a crop of oats, becomes so enthusiastic that he bursts into song :—

> 'When poets call for aid do they invoke
> The oyl of barley, hops or Indian smoke? *
> Must Bacchus fill their veins? these drown and smother
> And dull their wits; give me the oyl of clover,
> One drop of which contains such virtue in it
> It makes a perfect poet in a minute
> I crave no aid; give me the goose's quill,
> That's fed with clover, and I'll try my skill.
> But three-leaved grass soon yield a three-fold profit;
> Three volumes may be writ in praises of it'.

Perhaps fortunately, adds Dr. Russell, the poet never carried out his intention. The fact remains, however, that in spite of its poetic exaggeration, 'Three leaved grass soon yield a three-fold profit' embodies a great truth, and might be taken as a motto by the good planter.

* This line, of course, refers to whisky, beer and tobacco; Bacchus, in the next line, is the god of wine.

THE EMPLOYMENT OF TRACTORS.

There are indications that tractors will be increasingly employed in the West Indies for cultivation work on estates. The successful employment of a Fordson Tractor at Foursquare estate in Barbados is reported, and information is at hand of a more detailed character concerning the work of the Titan tractor in Antigua manufactured by the International Harvester Company, United States of America. Figures are not yet available regarding the amount and cost of the work done in Barbados, but in Antigua on average land the tractor ploughs 3 acres per day. The cost of ploughing 1 acre by the Titan tractor in Antigua works out at *13s. 4d.* while the cost for cattle ploughing per acre is about 14*s.* 8*d.* In addition, it should be added that the tractor can pull 8 tons of canes uphill of normal gradient at a speed of $2\frac{1}{2}$ miles per hour. As well as the machine referred to there was imported into Antigua during 1918 an Avery tractor. A report on the work of this tractor has not yet been received.

In connexion with tractors an instructive *Farmers' Bulletin* (No 1035) United States Department of Agriculture deals with the work of farm tractors in the Dakotas. Several generalizations are put forward in this Bulletin. One is that the influence of the tractor in causing an increase in the size of farms is much more marked than that of any machine since the introduction of the grain binder. It it fairly obvious that a small estate is no place for a tractor costing perhaps £400 or £500.

It might be noted however by the owners of small estates and holdings in the West Indies that an implement like the Beeman Garden Tractor might answer their purpose. We are in receipt of pamphlets illustrating this small tractor and it appears as far as one can judge from advertisements to be very well adapted for cotton and corn cultivation in the West Indies. Its cost is about $300. Further information can be obtained from Mr. P. R. Gransaull, Sole Agent, Trinidad.

To continue the account of the statements made in the Bulletin referred to above, it should be remembered that one of the largest items which go to make up the total cost of performing work with the tractor is depreciation, yet this, is one of the items which many people ignore entirely when figuring tractor cost. The advantages of a tractor, like that of most other improved farm machines, lies not so much in the reduction of the cost of performing a unit of work as in the fact that it permits one man to do considerably more work within a given period of time. Lastly before putting anyone in charge of a tractor he should be given experience under a competent instructor. The mistake should not be made of assuming that any boy can operate a tractor in an efficient manner; only a proficient operator can handle a tractor properly. This has been discovered in Antigua. At present the lack of even one trained operator has been felt in Antigua and this trouble will be more pronounced as the numbers of tractors imported increase. It is a difficulty however that should not be hard to get over.

Map of the World's Sugar Production.—We have received from W. J. Wayte, Incorporated, Engineers, 1 Liberty Street, New York, an instructive map of the two hemispheres printed in colours showing the distribution of sugar production throughout the world. The map also contains a coloured diagram showing the production in different countries in 1914 and 1918. This interesting diagram shows the great increase of sugar during the war in tropical countries and the great reduction of beet sugar production in European countries like France, Germany, Austria and Russia. The most phenomenal increase has taken place in Cuba. In 1914 about $2\frac{1}{2}$ million tons of cane sugar were produced while in 1918 nearly $3\frac{1}{2}$ million tons were produced. There has also been a big increase in India and Java but in the former country, of course, nearly all the sugar is consumed locally It might be added in connexion with this map that recent advices indicate that the price of sugar will remain at a high level for some considerable time in the future.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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**Seconded for Military Service.*

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial in this issue, an attempt is made to explain the decline in the sugar content of central factory canes in Antigua and St. Kitts.

The question as to whether Criollo cacao is disappearing from cultivation is dealt with in an article on page 244.

Insect Notes in this issue consist of an article on some insect pests in Costa Rica.

On page 254, will be found an illustrated article on the subject of the wither-tip of limes in Trinidad.

A Floating School.

Dr. Sambon of the London School of Tropical Medicine is reported by the *West India Committee Circular* to have advocated the establishment of a floating school of medical research for the West Indies. This idea has been thought of before in connexion with agricultural research. It would certainly seem feasible to fit a vessel with the necessary laboratory and office accommodation for such purposes, but it is feared that the cost of upkeep and the initial expenses would be prohibitive at any rate for the present. Yet the idea has much to commend it. It would mean that scientific workers would be in constant personal communication with the different islands. In the case of agricultural research this would be productive of very great benefit especially for a central institution like the Imperial Department of Agriculture. It might be possible to incorporate in such a floating research school, a section of marine investigators who would have ample opportunities for developing the resources of the sea in the neighbourhood of the different islands. It will be interesting to see whether Dr. Sambon's suggestion is taken up seriously by the authorities concerned.

Brimstone Tree of Sierra Leone.

An interesting tree, known botanically as *Mitragyne stipulosa*, occurring in Sierra Leone and throughout nearly the whole forest area of tropical Africa, is described in the *Kew Bulletin of Miscellaneous Information* (Nos. 1 and 2. 1919). It is referred to as a very large forest tree, without buttress roots, growing to a height of 150 feet, and a diameter of over 6 feet at the base. The bole is straight and generally 40 to 50 feet to the first branch. The bark is grey, rough and stringy. The tree yields a very durable, useful, timber; floors built of this wood may be seen in Freetown up to 100 years old. It is of a yellow colour—hence the name—when freshly sawn, but turns much browner with age. Young saplings are preferred to any other for rafters in native thatched houses. A decoction of the bark is used as a cure for malaria, and the natives, foot-sore by long marching, bathe their feet in water in which the bark has been boiled. The leaves of this tree are the only ones used to wrap up kola nuts. The reason for this selection is not explained. As far as information is available, we have no specimens of this interesting tree in the West Indies.

Costs of Production in the Sugar Industry.

Some important factors have been disclosed in a report issued by the United States Tariff Commission and dealt with in *Sugar* for May 1919. Comprehensive tables were prepared showing the total cost and segregated items of cost for every factory from which returns were received. They cover the cane industry of Cuba, in Hawaii, in Louisiana, in Porto Rico and the beet sugar in the continental United States. Figures are also given showing the difference between

war and pre-war cost. In general big companies show low cost of production while small enterprises are expensive. This is what one would be led to expect.

Table IV, which is published in the article in *Sugar* referred to, shows that the total average cost of producing a ton of sugar in Cuban factories during 1913-14 was $35·66 against $80·17 in 1917-18, deducting the cost of by-products. In the case of Hawaii it was $61·34 in 1913-14 against $106·79 in 1917-18. For Porto Rico the figures are $57·71 for 1913-14 against $94·23 for 1917-18. From the Report on the Antigua Central Factory for 1918 we calculate it cost $63 to produce a ton of sugar, deducting value of the molasses, while in 1913 the cost was $40.

Agricultural Credit Societies in Trinidad.

In connexion with the article in this issue on Agricultural Credit Societies in St. Vincent, it may be noted that, according to the *Bulletin of the Department of Agriculture* of Trinidad and Tobago (Vol. XVIII, No. 1), good progress continues to be made with these societies in these last named islands. In Trinidad, five new societies have recently been registered. During April and May the Inspector of Credit Societies visited six societies at work in Tobago, inspected their books, gave instruction and assistance in the keeping of accounts, and addressed a meeting of the members of each society.

The development of the mutual credit movement in the West Indies is yet another example of what can be done by Government assistance and encouragement. It was not long ago that people said that mutual credit could never succeed in the West Indies; that the peasants were not sufficiently sophisticated. This has been disproved by recent experience in Trinidad, St. Lucia and St. Vincent. A great deal of the success attained has been the result of personal interest and energy shown by those officials connected with the societies, and to these officials the gratitude of the public is due.

British Cotton Growers' Association.

The Annual Report of this Association for the year ending December 31, 1918 has been received. It states that the Indian cotton still proves unsatisfactory for the bulk of the Lancashire spinners. Cotton cultivation in Ceylon, has for several reasons come to a standstill. The results for the West Indies for the year under review showed considerable improvement on the figures for the previous year. Nigerian cotton showed a decrease largely due to the local demands for local spinning. Uganda cotton was likewise small in yield owing to its having been produced and exported under difficulties. Cotton is the most important crop in the Protectorate and with better seasons and the return of labour from war duties, the position should rapidly improve. The same remarks apply to Nyasaland. New interest is being taken in cotton in Rhodesia and in South Africa, and one may look to see developments in these places Cotton production in the Sudan showed a great falling off. In conclusion it would seem that, except for the West Indies, cotton production in the British Colonies during 1918 was not as satisfactory as could be wished for.

Criollo Cacao.

Readers interested in cacao will acknowledge that the article on page 244 opens up a very important question. There is little doubt the hardier Forastero types are gradually replacing the more susceptible Criollo types in many cocao countries.

Perhaps the true position as things stand at present, is that on most estates the cacao is mixed, that is, intermediate types between Criollo and Forastero are to be found.

The only certain way of producing uniform cacao is to grow trees that have been grafted. Very successful experimental work has been done along this line at the St. Clair Station. Port-of-Spain, Trinidad. But for estate purposes, grafting presents difficulties. The expense is considerable. Moreover, on estates already established, little more can be done than to plant grafted plants in the place of old trees. In time the trees become more uniform; eventually it should be possible to have the trees perfectly uniform.

Grafting, however, does not solve the difficulties attendant on the susceptibility of Criollo. A scion of Criollo is as susceptible as the complete tree. But it should be possible to grow a better type than the Forastero kinds by means of grafting, that is a type more hardy than the Criollo, and of better quality bean than is characteristic of the Forastero.

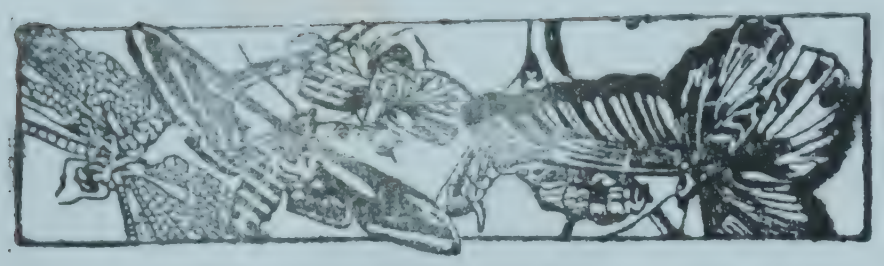
Influence of Heated Soils on Growth.

Practically all soils heated to approximately the boiling point of water first retard germination and growth and then cause an increased rate of growth According to the results of Mr James Johnson, published in *Soil Science* (Vol. VII. No. 1.) different soils vary markedly both in toxicity and beneficial action to seed and plants. This is correlated not with any one soil factor but with the balance of all factors concerned. Seeds vary greatly in their sensitiveness to the toxic action. The degree of sensitiveness of seeds is roughly characteristic of their genetic relationship. The Gramineae and the Cucurbitaceae are usually resistant and the Leguminoseae and Solanaceae are usually more susceptible.

Growing plants also differ markedly in their sensitiveness to the action of heated soils.

The growth of fungi in heated soil is correlated with the toxicity to seed germination and plant growth on any one soil.

The subsequent beneficial action of highly heated soils is believed to be largely due to the ammonia liberated on heating.



INSECT NOTES.

NOTES ON SOME INSECT PESTS IN COSTA RICA.

The notes which appear below are copied from the *Journal of Economic Entomology* for June 1919 (Vol. 12, p. 269). They are by Mr. James Zetek, Entomologist, Ancon, Canal Zone, and they give an account of some observations made while on a visit to Costa Rica, during February and March of this year, of some of the insect pests of that country.

The three insects mentioned are of interest to the West Indian readers of the *Agricultural News*.

The purple scale (*Lepidosaphes beckii*) is a pest of long standing of all citrus plants throughout the West Indies; the spiny citrus white fly (*Aleurocanthus woglumi*) has recently attracted attention by its attacks on citrus in Cuba, Jamaica, and the Bahamas (see *Agricultural News*, Vol. XVI, pp 10 and 282); the Hawaiian sugar-cane borer (*Rhabdocnemis obscurus*) while abundant throughout the sugar-producing localities in the Pacific is not known to occur in the West Indies or in Central America, although Dr. W. D. Pierce in the 'Manual of Dangerous Insects, likely to be introduced into the United States through importations', gives West Indian localities in the distribution of this pest. The inclusion of these localities would appear to be an error (see review in this Journal, Vol. XVII, p. 391).

Formerly, the genus Sphenophorus was made to include the West Indian weevil borers of the sugar-cane, (*Metamasius sericeus* and *M. hemipterus*), the black weevil borer of the banana (*Cosmopolites sordidus*) and the Hawaiian sugar-cane borer (*Rhabdocnemis obscurus*), but the last mentioned species has always been considered to belong definitely to the Pacific regions, and not to the Caribbean or Atlantic localities.

These insects are all similar in habit. They generally attack dying or decaying plant tissue, although *obscurus* is said to be a serious pest of healthy sugar-cane, and they all seem to have much the same range of food-plants. The species *sordidus* is recorded as a pest of banana (see *Agricultural News*, Vol. XVI, pp. 298 and 347); all the others are recorded as pests of sugar-cane, but they attack bananas; the species *obscurus* attacks, in addition to sugar-cane and banana, the coco-nut and other palms, and the papaw, while the species *sericeus* has been found attacking the decaying 'may pole' or flower stalk of a large agave.

The accompanying illustrations (Figs. 1 and 2) will serve to give an idea of these insects. The species *sericeus* and *hemipterus* are similar in colouring, being brown, with darker markings, while *obscurus* and *sordidus* are uniformly dark, almost or quite black.

'The most important "find" was, no doubt, the "mosca prieta", or spiny citrus white fly (*Aleurocanthus woglumi* Ashby). It was very abundant on citrus of various species a Limon, and at all the stations of the Northern Railroad as far as Peralta. At Cartago, at an elevation about 1 mile, it was not found. The degree of infestation was worse than it is in the Canal Zone. The trees were so heavily infested as to be readily noticeable from the car windows. This white fly occurs probably all through Central America and tropical South America, particularly along the Atlantic seaboard. From questions asked of the customs and port authorities, and from actual observations, it would appear that this insect gained access to Costa Rica from small sailing vessels coming from San Andres and other islands of the Caribbean. It seems to be an inborn custom of the islanders to carry potted plants wherever they go. Thus far, fifty-two hosts, representing twenty-six families of plants, have been recorded for *A. woglumi*, among them being the various species of citrus, mango, star-apple, cashew apple (maranon), papaya, cherimoya, mamei, plantain, and coffee.

'The purple scale, (*Lepidosaphes beckii*, Newm.), and sooty mould were extremely abundant on both leaves and fruit of citrus.

×2.

Fig. 1. Weevil Borer of the Sugar-cane Adult

Fig 2. Weevil Borer of the Sugar-cane grub.

'Another bad pest was the Hawaiian sugar-cane borer, (*Rhabdocnemis obscurus*, Bois.) It was exceedingly abundant at Zent, C. R. in banana stumps and cuttings. As many as forty adults were taken out of a small piece of stalk about a foot long. Dr. W. D. Pierce, in his 'Manual of Dangerous Insects', cites the following hosts for this weevil: banana, sugar-cane, coco-nut, sago-palm, royal palm, wine palm and papyrus.

'The important observation here was, a few adults were found crawling on the leaves of the banana, showing that this serious pest can very easily be introduced into the United States among the banana leaves used as packing for fruit on boats calling at New Orleans. At Limon, and awaiting boats for shipment to the United States, were about a hundred flat cars loaded with Balsa logs, and, from data obtained, these were here from one to four weeks. Under the bark of these logs were found a number of lepidopterous larvae and pupae. The great majority of the logs were infested with several species of borers, specimens of which have been sent to the Bureau of Entomology for identification. These borers were very active and abundant. As the determinations are lacking at present writing, it is impossible to say whether they are already present in the United States. However, the degree of infestation, and the ease with which such logs can enter the United States, make the introduction of such pests a certainty, and it is time to pay attention to the possibilities of this source of danger. Otherwise many new and dangerous pests will unquestionably be added to our already large list of insect-immigrants.'

PRODUCTION OF SANITARY MILK.

Volume XVII, No. 428 of the *Agricultural News* contained an article dealing with experiments undertaken by the United States Department of Agriculture with the object of investigating and determining the four essential factors in the production of milk of low bacterial content. In this connexion *Farmers' Bulletin*, No. 1,019 of the United States Department of Agriculture entitled 'Straining Milk' contains the following suggestions which if followed by dairy keepers would ensure the production of sanitary milk.

The milking barn should be clean, and well lighted and ventilated. The stalls should be built with regard to the size of the cows. Droppings should fall in the manure gutter and the cows should have a clean, dry well-bedded place on which to lie.

Keep the cows groomed to remove loose hair and manure.

Before milking wash the cows' udders and flanks and wipe with a damp cloth.

Milk with clean, dry hands into a clean, sterilized, small-top pail.

Remove the milk immediately to the milk house, where it should be strained and cooled at once.

Keep milk tightly covered at all times.

Protect clean utensils from flies and dust.

The same bulletin publishes the following summary dealing with sediment in milk:

Sediment in milk indicates carelessness in its production or handling.

Sediment contaminates milk and make it less saleable.

Most of the sediment in milk comes from the bodies of the cows and consists of hairs, manure, bedding, etc.

Straining removes only the coarse particles of dirt and removes neither the bacteria nor the fine dirt.

Straining improves the commercial quality of milk, but does not appreciably improve its healthfulness.

The best system is to prevent, so far as possible, the entrance of dirt into milk. This can be done best by having clean cows in clean stables, milked with clean hands, into clean, small-top pails.

Filter cloth and absorbent cotton are efficient materials for strainers. Cheese cloth and wire gauze are less effective.

Straining cloths should be changed whenever they become soiled. They should be thoroughly washed and sterilized after each using. Efficient sterilization is accomplished by boiling or exposure to steam for at least five minutes.

THE BOTANIC GARDEN AT HAVANA.

Probably the oldest Botanic Garden in the West Indies is the one at St. Vincent which was established in 1765—over 150 years ago. According to the *Kew Bulletin* of *Miscellaneous Information* (Nos. 1 and 2 of 1919) a botanic garden was founded at Havana in 1817. In reviewing a recent publication—*El Jardin Botanico del Instituo de Sugunda Ensenanza de la Habana*—the Bulletin says :—

A Botanic Garden was founded at Havana on May 30 1817, under the auspices of the 'Sociedad Patriotica de Amigos del Pais', and an interesting account of the present garden, which is now attached to the Institute of Secondary Education, has recently been published by Dr. Felipe Garcia Cañizares. The volume is well illustrated with views and plans of the garden, and contains numerous plates and figures of the more interesting plants, that are in cultivation. A general catalogue of the indigenous and exotic plants grown forms a valuable portion of the work as the native names of the plants are given with their scientific names, and the whole catalogue is arranged under the natural families. A special account, with figures, is given of the Ocuje (*Calophyllum Calaba* Jacquin) and there is a complete alphabetical index.

From the historical account of the garden, which occupies the opening pages, we learn that the suggestion of establishing a Botanic Garden at Havana was first made in 1793 by Nicholas Calvo and Mariano Espinosa, but despite the efforts of these originators of the scheme, and the interest displayed by Martin Sesé, the project was not fulfilled until the year 1817, when the garden was commenced on land granted by Sr. Alejandro Ramirez.

The first Director of the Garden was Sr. José Antonio de la Ossa, the author of the 'Flora havanensis'.

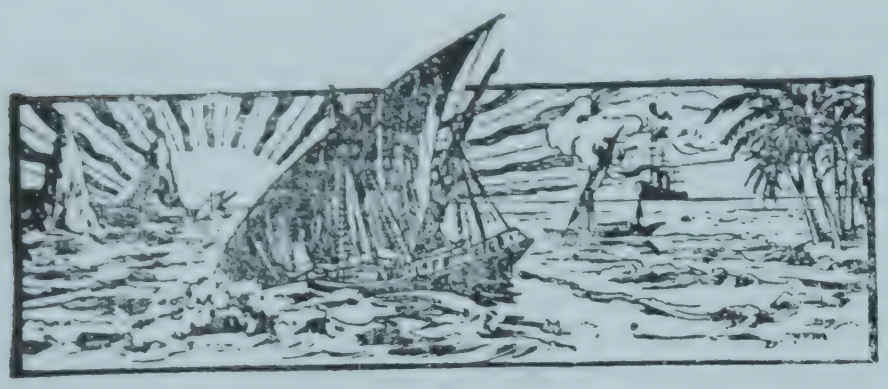
In the year 1824 the Chair of Botany was established, and Sr. Ramón de la Sagra was appointed the first Professor and in 1827 became exclusive Director of the Garden. He enlarged the garden considerably and also did much for the encouragement of Cuban agriculture.

The garden at a later date was united with the Institucion Agronoma in the Escuela Botánica Agricola, and was finally placed under the Real Hacienda as a State Institute.

The third Director was Dr. Pedro Alejandro Auber, the distinguished naturalist. From 1864-97, the second epoch in the history of the garden, there is little to record, as its scientific and administrative work was sadly neglected, except that in the year 1866 the garden became a dependency of the University. In 1897 the Director of the Institute of Secondary Education obtained a portion of the garden for his school, and it is with this part of the original garden that the present account is concerned. The garden has been restored to its proper functions under the direction of Dr. Fernando Reynoso, and to his enthusiasm and energy the present prosperous condition of the Havana Garden of the Institute of Secondary Education appears largely to be due.

Those interested in the spraying of crops will find the methods of testing copper spray coatings in the field, as described in *Bulletin No. 785*, United States Department of Agriculture, of great assistance. The objects of the methods are to find out the persistence of sprays, to secure prompt correction of faulty spraying practices, and similar matters bearing upon the same subject.

A valuable series of researches into the treatment of malaria is dealt with in the *Annals of Tropical Medicine and Parasitology* (University of Liverpool), Vol. XIII, No, I. The injection of quinine bi-hydrochloride was found to cause the disappearance of the malarial germs from the blood, but the action was only temporary. . . As a palliative, quinine sulphate suffices to keep the blood free and to prevent relapses in the majority of cases. A combination of arsenic with quinine in the doses used is not more effective than quinine alone.



GLEANINGS.

It is stated in the *Journal of Agricultural Research*, Vol. XVII, No. 1, that experiments completed, indicate that formaldehyde gas treatment is a very efficient means of seed disinfection. It is well known that the use of liquids for disinfection is unsatisfactory for many kinds of seeds.

An additional export duty on palm kernels has been imposed by the Government of Nigeria. The increase is at the rate of £2 per ton. If shipped to a port within the Empire, the exporter may, in lieu of paying the duties, give a bond in prescribed form for the amount of such duties.

American experiments in electrical stimulation of crops, reported in the *Experiment Station Record*, Vol. 40, No. 5, have indicated that overhead treatment with a high tension current increased the yield of onions 633 per cent. The effect on this crop was much greater than that on any other.

The propagation and culture of the date palm is the subject of *Farmers' Bulletin, No. 1006*, United States Department of Agriculture. This bulletin is intended to furnish growers with definite instructions for the rooting of date offshoots and for their subsequent care in the orchard.

According to the *South African Sugar Journal*, the South African Cotton Growers' Association is likely to be converted into a co-operative Society with limited liability. It is believed that this will greatly stimulate the production of cotton, and it is predicted that in ten years' time there will be more cotton than maize grown in South Africa.

An interesting historical account of the rain tree of Hierro, Canary Islands (*Oreodaphne foetens*) appears in the *Kew Bulletin of Miscellaneous Information*, No. 3 of 1919. This tree was described in the *Agricultural News* of May 3, 1919. The present account will give a great deal of additional information to those interested in the subject.

Experiments conducted in the Dutch East Indies have indicated that the latex from the upper and lower cuts on rubber trees shows very little variation so far as density, tensile strength, rate of cure, and viscosity are concerned. The *India Rubber Journal* for June 7, 1919, says that these results will definitely settle the controversy that has existed on this point for some years.

Agricultural prospects in Surinam are, according to *The Board of Trade Journal* for April 24, 1919, anything but encouraging. Extra profits realized by estates have been mostly swallowed up in extra taxation. Labour is most difficult to secure. Of bush products, balata has fared the best. The chief agricultural crops are coffee, cacao, sugar, maize and rice.

In connexion with the suggestion to fix nitrogen from the air, utilizing water power in the West Indian islands, an article on the method of doing so in New Zealand, published in the *New Zealand Journal of Agriculture*, Vol. XVIII, No. 4, will be found interesting and useful. The value of electric furnaces is also dealt with.

A new method of grafting is reported by the *Experiment Station Record*, Vol. 40, No. 5. The method was adopted to rejuvenate old grafted grape vines. Vigorous sprouts from the old stock were shield-budded and then layered about 5 inches deep in mounds of mellow, fresh soil. Union is perfected in about three weeks time, after which the soil is removed, and the shoot continues its normal growth.

A disease of corn caused by a fungus (*Physoderma* sp.), is dealt with in the *Journal of Agricultural Research*, Vol. XVI, No. 5. It occurs in the Southern States and is probably identical with the disease reported by Shaw in India. There is a possibility of controlling the disease through sanitation, crop rotation, and resistant varieties. The malady affects the leaves, but at present does not appear to cause a serious amount of damage.

It is stated in the *Louisiana Planter* for June 21, 1919, that the possibilities of Mexico as an important sugar producer should be more appreciated. Sugar is grown in Mexico in eighteen of the twenty-eight States forming that Republic. Mexican production has increased from $1\frac{1}{2}$ million tons of cane in 1903-4 to over 3 million tons of cane in 1906-7. A more settled form of Government, however, must be established before any great progress can be made in the future.

According to the Annual Report of the Education Department of Jamaica, 1918, the teaching of agricultural and elementary science in the schools of Jamaica is not making as much progress as could be desired. As regards school gardens, these have not had as much attention since the last hurricane as they had previously. It is stated that the cultivation of 'war gardens', near the homes of the older children has proved popular.

We have received copies of two important scientific monographs, which biologists in the tropics may find useful for reference. The first is one dealing with the amphibians and reptiles of Cuba, entitled 'The Herpetology of Cuba,' (*Memoirs of the Museum of Comparative Zoology*, Harvard College, Vol. XLVII, No. 2), by Thomas Barbour and Charles T. Ramsden. The second is on the Verbenaceae of the Malayan Archipelago, by H. J. Lam, issued by M. de Waal, Groningen.

Mr, D. F. Houston, Secretary of Agriculture of the United States, in an address before the Trans-Mississippi Readjustment Congress, during February 1919, said that a bill is before Congress which will make available for road construction in the next few years, under the terms of the Road Act, from Federal and State sources, about $550,000,000. Large additional amounts will be expended by each State on projects of its own. Never before has there been such activity in road legislation and planning, due, in no small measure, to the stimulus of Federal aid.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ANTIGUA. Mr. T. Jackson, Curator, Botanic and Experiment Stations, states that during June, plots of peas, beans, yams and sweet potatoes were planted. The work of cultivating the sugar-cane variety nursery at Skerrets was begun. During the month 2,219 plants of *Agave sisalana*, 322 lb. of cotton seed and 4 palms were distributed. Numerous boxes of Eucalyptus seeds were sown and many young plants of the same transplanted. Numerous mahogany and other plants were potted. The beds, borders, lawns, etc. received necessary attention. The young cane crop on the whole was looking very promising and the young cotton crop was healthy. It is expected that only a small onion crop will be reaped. Messrs. Henkell du Buisson & Co. are offering land for sale to peasants on conditions similar to those obtaining in connexion with the Antigua Land Settlement Scheme which is being carried out at Sawcolts. Investigations in connexion with hardback grubs, are being continued. During the month 274 crates of onions were shipped by the Growers' Association. The work of examining selected cotton was commenced. Several meetings of the Board of Management of the Onion Growers' and Cotton Growers' Association were held. The rainfall for the month was 3·68 inches. The total amount for the year up to the end of June was 16·96 inches.

ST. KITTS. Mr. F. R. Shepherd writes to say that during June work in the Experiment Station consisted principally in the planting of certain plots. Regarding staple crops, the reaping of the cane crop in connexion with the Central Sugar Factory had been nearly completed. The returns obtained per acre from many estates have exceeded their estimates owing to the heavy rains in April, and the average for plants and ratoons in the Northern Districts will be about 23 tons of canes per acre, and for the Valley estates about 18 tons. The muscovado estates are almost all making syrup, and much difficulty has been experienced by some of the estates in getting packages for storing, the reaping of the crop being greatly delayed in consequence. The cotton crop considerably improved during the month and in some districts very advanced cotton could be seen with first pickings. So far there has been no appearance of any disease or pest. Information was received from England stating the probable average price for cotton would be 60 cents. The rainfall for the month was 3·96 inches and for the year to date 16·60 inches.

NEVIS. At the Experiment Station, writes Mr. W. I. Howell, trouble has been caused through the dry weather. Most of the plots at the end of June were making very slow progress. As regards distribution, the following were sent out: cotton 216 lb., cassava cuttings 200 and sweet potato cuttings 250. Concerning staple crops, the old cane crop was being reaped, but the young canes were suffering very much from want of rain, and many fields still needed supplying. There was a great scarcity of ground provisions during June, as it was not found possible to carry out any planting during the long spell of dry weather. Great difficulty was experienced in getting the cotton crop established. Large quantities of seeds were used as many of the fields had to be replanted and supplied several times, and, in some cases even then were not established. There were a few fields of early cotton which were doing fairly well. Special work of the Agricultural Instructor consisted in visiting plantations including Pinneys coco nut estate A meeting of the Agricultural and Commercial Society was held during the early part of the month at which letters *re* cotton prospects were read and discussed. The rainfall for the month was 2·29 inches; for the year to date 11·89 inches.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets, for the month of June :—

In reporting on the condition of the Produce Markets for the month of June it has to be borne in mind that it is the first summer holiday month of the year affecting most of the centres of industry such as the docks and customs and this year followed closely by the Whitsuntide holidays, all of which have had a depressing influence on the amount of business transacted at the Docks or in Mincing Lane. The following are the principal items of interest.

GINGER.

At auction on the 12th of the month ginger was in full supply, slightly wormy brown Calicut sold at 65*s.* 6*d.*, at which rate 103 bags were disposed of, while 399 bags of washed rough and partly wormy Cochin were bought in at 65*s.* At auction on the 25th as many as 1,368 packages of nutmegs, mostly West Indian were offered, the bulk of which were disposed of at 1*d.* to 2*d.* per lb. cheaper than previous rates for sound, and ½*d.* to 1d. per lb. for defective. At auction on the 12th of the month mace was represented by 24 cases of Java, all of which were disposed of, fair, flat, slighly wormy fetching 1*s* 3*d.* to 1*s.* 4*d* per lb. and good bold 1*s.* 5*d.* to 1*s.* 6*d.* Pimento has been stationery throughout the month at 5*d.* to 5¼*d.* per lb.

At auction on the 5th of the month sarsaparilla was represented by 29 packages of grey Jamaica, 77 of native Jamaica, 79 of Lima and 12 of Mexican. There were no buyers for either the grey Jamaica or the Mexican, the first named being bought in at 3*s.* and the Mexican at 1*s.* 9d. per lb.

ANNATTO SEEDS, CASSIA FISTULA, KOLA, LIME JUICE, LIME OIL, CITRIC ACID, ARROWROOT, AND TAMARINDS.

At auction on the 5th of the month some 30 packages of annatto seed were offered but none were sold. It was stated that both East Indian and Java seeds were obtainable at 6*d.* per lb. At the same auction on the 5th of the month Cassia Fistula was reported as being very scarce and was represented by 4 packages only, fair bright fetching 160*s.* per cwt. Kola has been in demand at fair rates: 119 packages were offered at auction on the 5th of the month. Good Ceylon halves fetching 6*d.* to 6½*d.* per lb. and good African quarters 6¾*d.* to 7*d.* Lime juice was in good supply on the 5th of the month when 5 puncheons of good pale raw were offered and held at 3*s.* per gallon. Two cases of hand pressed West Indian oil of limes were also offered at this auction and held at 14*s.* per lb. Citric acid has been firm throughout the month at 4*s.* 4*d.* to 4*s.* 5*d.* per lb. Manufacturing St. Vincent arrowroot was quoted at the end of the month at 6*d.* per lb. and fine at 7½*d.* West Indian tamarinds were reported cheaper at the end of the month. Good Barbados being quoted at 70*s.* to 75*s.* per cwt. and Antigua at 45*s.* to 50*s.*

THE WITHER-TIP OF LIMES IN TRINIDAD.

The following paper by Mr. J. B. Rorer, Mycologist, Board of Agriculture, Trinidad, is reproduced from the *Bulletin of the Department of Agriculture*, Trinidad, Vol. XVIII, Part 1. We are indebted to the Board for the loan of the block illustrating this article:—

During July and August 1918, there was a severe outbreak of a disease of lime trees throughout the colony, practically all districts being equally affected. Specimens were received from a large number of different estates, and all showed 'wither-tip' in its characteristic form. This is one of the commonest and most destructive diseases of limes, though heretofore, it has not been very prevalent in Trinidad.(1) It is due to the fungus known as *Glæosporium limetticolum*, Clausen. The fungus is able to attack the young growth of lime plants of all ages; in fact, at the St. Clair Experiment Station it has caused the death of a great many nursery plants of from 6 inches to a foot high, during the past two years. (1)

Wither-tip Disease of Limes.

APPEARANCE OF THE DISEASE.

The attacks of the fungus generally show on the tips and edges of the very young leaves, but they affect also the leaf-stalk, at the point where the leaf joins the stem, or any point in the very young shoots. The first sign of infection is indicated by a somewhat water-soaked appearance, until the young leaves and tip of the shoot are entirely destroyed. If the weather is not so damp, the water-soaked appearance is not so pronounced, but the attacked part is light green in colour at first, and then becomes brown. In all cases, the affected shoots wither up, thus giving the popular name of the disease. When the larger young leaves are affected they often become curled and distorted, and the infected areas drop out or become cracked, so that the leaf is punctured with holes. Only young growing leaves and the young shoots apparently can be attacked by the fungus; leaves and shoots that have become hardened and matured are quite immune to the disease.

In addition to the leaves and the tender shoots, the flowers (1) and young fruit are very susceptible to attack, and on this account, the disease causes a great loss of fruit. If the flowers are attacked, they fall from the tree without setting fruit. When young fruits are attacked, they show a rough scabby appearance and become cracked, and generally fall from the tree in two or three weeks.

After the fruits have become half-grown, they seem to be immune to further attack. Full-grown fruits, after having fallen to the ground, however, may be attacked through wounds, and the fungus in this way, probably causes a good deal of rotting of the fruit from the time of gathering until it reaches the factory.

TREATMENT OF THE DISEASE.

As this disease became epidemic last year, it is quite probable that under favourable conditions, it may do even more damage this year, and everyone should be prepared to combat it. Fortunately, it is comparatively easy to treat. If possible, all the dead wood and diseased leaves should be collected and burned during the dry season, and as soon as the trees begin to make their new growth after the rains begin, they should be thoroughly sprayed with Bordeaux

(1.) This disease must not be confused with the 'Damping-off' disease which is very severe on seedlings when they are from 1 to 3 inches high, and which has already been described in the *Proceedings of the Agricultural Society*, XV, 1915, 14-15. 'Wither-tip' generally attacks the plants when they are a little older.

mixture 4 4-50, to every gallon of which should be added a sticker, made as follows:—

Resin ...	...	...	...	2 lb.
Washing soda (crystals)	...		...	1 lb.
Water ...	...	...	...	1 gallon

Mix, and boil until the preparation is a clear brown, about one hour. This will make the Bordeaux spread and stick to the glossy surface of the lime leaves. After the first application has been made, the trees should be watched very carefully as time goes on, to see whether or not the new growth is becoming infected. If infections are found, it would be advisable to make another application of Bordeaux mixture. The number of applications necessary can only be judged according to the climatic conditions throughout the growing period.

Mr. W. G. Freeman, Acting Director of Agriculture, Trinidad, adds the following notes :—

The above article was written by Mr. Rorer before he left for Ecuador.

In the Report of the Porto Rico Agricultural Experiment Station for 1917, pp. 29-30, reference is made to what is apparently the same disease :—

'The wither-tip fungus (*Colletotrichum glæosporioides*) has been quite active during the past year, partly because of lowered vitality in the trees from lack of fertilizer. A few cases have been noted in which the initial injury results from poor drainage, impervious subsoil, or use of sprays. The damage done by this fungus to vigorously growing trees is very slight.'

In the course of a visit paid on one day by Mr. Urich and myself to three lime estates in Trinidad, with very similar climatic conditions, it was noticeable that the disease was much more marked in places where the cultivation was poor. Thus on one estate, the older trees which have been in an abandoned condition for several years were badly affected, whilst close by, young trees under good cultivation showed no sign at all of the disease.

In order to guard against the introduction of the disease into lime-producing islands in which it is not at present known, Proclamations have been issued in the Colonies of the Leeward and Windward Islands, prohibiting the importation of all Citrus plants and parts of Citrus plants, including their fruits, from all parts of the West Indies excepting those free of the disease, e.g. Antigua prohibits importations from British Guiana or any island or place in the West Indies except the islands of Dominica, Montserrat, St. Lucia, and Grenada.

(1) The disease is for this reason also known as Blossom-blight. (Ed.)

We have received from the Macmillan Company, New York, a copy of a new work entitled 'The Book of Cheese' by Charles Thom and W. W. Fisk. The subject of cheese making is of no practical interest in the West Indies, but to those readers who desire any information concerning cheese making, we recommend this comprehensive and instructive manual.

ANDERSON OIL EXPELLER IN THE FEDERATED MALAY STATES.

The successful working of the Anderson oil expeller in St. Vincent has been the subject of frequent articles in the *Agricultural News*. The following, by Mr. B. J. Eaton, Chemist, Department of Agriculture, Federated Malay States, on the working of one of these machines at Singapore will be read with interest.

The efficiency of an Anderson oil expeller which is said to have been running in Singapore for over ten years, under by no means ideal conditions, has been tested by me, by investigating the residual cake from various seeds with the following results :

	Oil (per cent.)	Moisture (per cent.)
Cake from ground-nuts	9·33	13·61
Cake from small round seeds (Illipé ?) (1st expression)	31·48	9·00
Cake from ditto after 2nd expression	16 76	12·63
Cake from ground-nuts	11·2	12·8
,, gingelly seed	11·2	12 7
,, ground-nuts	6·9	—
,, copra *	9·7	11·6

The small round seeds (Illipé) are imported from Borneo and yield a hard solid fat at the shade temperature 85° (Fah.) in Malaya. The fat is probably one of the oils classed as 'Illipé' fat or Borneo tallow.

The whole kernels contained 54·32 per cent. of oil and 7·59 per cent of moisture in one sample and 55·67 per cent. of oil and 6·91 per cent. of moisture in another sample. (The analysis of these samples was carried out by Mr. D. Coghill.)

A large, brown, flattened oval seed, also from a similar source and yielding a very similar fat, contained 51·41 per cent. of oil and 8·32 per cent. of moisture. No residual cake from these seeds after treatment in the Anderson expeller was available. (Analysis conducted by Mr. D. Coghill.)

The ground-nut cake and gingelly cake was derived from seed imported from India. The original ground-nuts contained 36·9 per cent. of oil.

These results indicate that the expeller in the case of the copra, ground-nuts and gingelly has a very good efficiency, although not quite as good as in the case of the most efficient hydraulic presses in which the oil in the residual cakes varies usually from about 6 to 8 per cent.

The lower efficiency in the case of the Illipé (?) seed is probably due to the nature of the fat and to the fact that the seed was not steamed to a sufficiently high temperature to render it fluid.

The results, in my opinion, indicate, from the point of view of efficient expression, that this machine would serve excellently for the purpose of oil expression in the case of the majority of seeds in the tropics, especially when its original cost and cheapness in running are taken into consideration.

For further details reference should be made to the preceding article[in the *Agricultural Bulletin of the Federated Malay States*, Vol. VII, No. I] on 'Methods and Machinery for the extraction of Oils from Seeds.'

* The sample of poonac or cake from copra was a sample obtained from copra expressed in an Anderson expeller in Ceylon.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, June 12.

BALATA—Venezuelan Block, no quotations; Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 122/6; Grenada, no quotations.
COPRA—£59.
HONEY—Jamaica, no quotations.
LIME JUICE—Raw, 2*s.* 7½*d.* to 3*s.*; Concentrated, no quotations.
PIMENTO—No quotations.
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD, May 27, 1919.

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Barbados.—Messrs. T. S. GARRAWAY & Co., July 22.

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HAY—$4·50 to $4·75 per 100 lb.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations
SUGAR—White Crystals—$8·00.

Trinidad.—Messrs. GORDON, GRANT & Co., July 4.

CACAO—Venezuelan, $26·00; Trinidad, $24·50.
COCO-NUT OIL—No quotations.
COFFEE—Venezuelan, 20c. per lb..
COPRA—$9·00 per 100 lb.
DHAL—$10·50.
ONIONS—$9·00 to $9·25 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $5·00 per 100 lb.
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New York.—Messrs. GILLESPIE BROS. & Co., July 11.

CACAO—Caracas, 26½c.; Grenada, 25c. to 25½c.; Trinidad, 25½c. to 26c.; Jamaica, 20c.
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COFFEE—Jamaica, 24c. to 26½c. per lb.
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GOAT SKINS—Jamaica $1·50; Antigua and Barbados, $1·50; St. Thomas and St. Kitts, $1·50.
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LIMES—$6·00 to $8·00.
MACE—41c. to 42c. per lb.
NUTMEGS—19c.
ORANGES—$3·50 to $4·00.
PIMENTO—8¾c. per lb.
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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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CONTENTS.

	PAGE.		PAGE.
Aeroplane for Surveying, The	265	Insect Notes :— Bean and Pea Weevils	266
Agricultural Costing	271	Items of Local Interest	262
Agricultural Officers, Status of	257	Jamaican Sugar Industry	260
Agriculture in Barbados	263	Koster's Curse	269
Atmospheric Disturbances, Recent	264	Market Reports	272
Cacao Production in the British Empire	267	Notes and Comments	264
Coco-nuts and Vanilla in Nevis	259	Papaw, A Freak	271
Departmental Reports	270	Rice, Eat Less	264
Gleanings	268	Rubber Trees, Tapping Cuts in	262
Hawaii, Training in Sugar Technology in	261	Silos and Ensilage	258
		Soil Deficiencies	265
		Spontaneous Combustion	269
		Swine Fever and Hog Cholera	264
		West Indian Cotton	260

The Status of Agricultural Officers.

THE success of colonial administration in the British Empire is recognized generally throughout the world. But it is also the case that this success is judged by the smoothness and economy of the administration, rather than by any constructive achievements. In other words, most of the credit falls to administrators, lawyers, and accountants, who are the officials responsible for order, expedients, and economies. Yet the material advancement of colonial countries is actually due, as far as the Government is concerned, to the work of the technical officials. Amongst these officials, the medical officers, the education officers, and the civil engineers come in for a reasonable amount of local recognition and political status. But in many instances the same cannot be said of another class of technical official, who without doubt, in tropical colonies, is indispensable, namely the agricultural officer.

The colonial service, as we know, is very ununiform—is full of anomalies. There is no strict relationship between rank and ability; there is no strict relationship, even, between rank and emoluments.* There is certainly very little correlation between sound knowledge and executive power. These anomalies are due to various causes. One is the absence of any system of entry by competitive examination. Another is the existence of very different conditions in the various colonies, which makes uniformity in the public services difficult. But the main reason for it all is the fact that the general public still believes that the legal and commercial mind is on a higher level than the scientific—at any rate in matters of administration.

This is not confined to the Crown Colonies. It is the same in England, and it was the same there five years ago. During the war, however, there was a change; men of science were in great demand; they were practically implored to save the country: and they responded with a good will. Now that the war is over they are no longer required

* In Barbados, for instance, the Director of the Local Department of Agriculture receives higher pay than the Colonial Secretary. It is one of the few instances where an agricultural officer might consider himself adequately remunerated.

in the public services, and have been asked to retire to their laboratories and keep quiet.

All agricultural officers in the colonial service are not scientific. Those who are not will be the first to acknowledge it. But they have a sound knowledge concerning the growth of plants, and, what is more important, the senior ones understand the agricultural economics of the colonies in which they work. Many of them are able business men. Where the business mind is combined with experience, scientific training, and a broad outlook, we get the highest type of agricultural officer. There are many such men in the colonies to-day, and, luckily, their number is increasing. These men are perfectly well qualified to have a voice, and a strong voice in matters of agricultural policy. They are not merely experimenters and advisers, but—so far as they are allowed to be—leaders and constructionists. It always seems an anomaly that a lawyer, or a clerk, or a schoolmaster, or a soldier can become a Colonial Governor, whereas a university graduate in natural science, with a sound knowledge of agriculture and economics, and often a good business mind into the bargain, cannot.

The status of the senior agricultural officer might be improved if he were appointed a member of his colonial legislative council. In some colonies, presidencies, and protectorates this has been done, but only in a few. As far as information is available, the only colonies where this has occurred are Fiji, Jamaica, British Guiana, Leeward Islands, Dominica, Virgin Islands, and Mauritius. It is somewhat curious that the officers of nearly all the colonies referred to are or were connected with the Imperial Department of Agriculture for the West Indies. Other reasons must be looked for, however, to explain the higher status of these agricultural officers. Length of service, outstanding ability, or absence of competition for the appointment may individually or collectively have carried weight. Those possessions, where the senior agricultural officer has no political status, constitute a long list. Amongst the most important are : the Gold Coast, Sierra Leone, Nigeria, Nyasaland, East African Protectorate, Straits Settlements, Ceylon, British Honduras, Zanzibar, Trinidad, Barbados, Grenada, and many of the other West Indian islands. It will be noticed that this list includes the principal cacao-producing colonies namely, Gold Coast, Ceylon, Trinidad, and Grenada. Owing to the lack of uniformity and co-operation in cacao production it is especially important to strengthen as much as possible the position of the agricultural departments concerned.

In conclusion we would urge upon the general public and the Colonial Governments to realize that the function of senior agricultural officers has changed from what it used to be. They are no longer curators of gardens, but officials interested in the general progress of the colonies. Perusal of their Annual Reports will prove this. Their status ought to be bettered and raised to the same level as that of principal medical officers and colonial engineers. They ought to have a strong voice in all questions of agricultural policy. Until this is done there will always be a tendency to keep able men out of the service, and a tendency to kill the ambition of those who are in it.

SILOS AND ENSILAGE.

The recent drought, experienced by many of the West Indian islands, was one of the worst that has occurred for many years. It has caused a most serious set-back to staple crops in some places, but the most critical trouble was the shortage of food it caused for live stock. Silos and ensilage is a remedy against such a recurrence, and in this connexion the following information taken principally from the Report of the Antigua Agricultural Department, 1917-18, will be read with avidity.

Quite recently a silo has been erected in Antigua, and it is possible that at least two others will also be built in the near future. The one that has been erected is 31½ feet high, and has a diameter of 16 feet. It is built of reinforced concrete. The method adopted when building this was to erect the iron frame work, and to plaster the sides until they were of the required thickness ; they are about 5 inches thick.

In consequence of the above, a few remarks on ensilage making may not be out of place at this juncture, in such a publication as this. Until quite recently ensilage making received little attention in the West Indies or in England, but in the United States and some other places the making of this form of fodder has been popular for a considerable time. A silo is an air-tight tank or chamber, and its function is to preserve green, succulent, cattle food. In the United States maize is extensively used for this purpose, and, as pointed out by various authorities, a considerable amount of the feeding value is in the stalks. As this portion of the corn plant is in Antigua seldom fed to stock, it will be seen that considerable saving of feed would take place if silos were extensively used locally. It might be said that if corn were to be grown for ensilage, it would probably be advisable to plant it much more thickly than is practised now. In South Africa, the time when it is considered advisable to reap maize for silo purposes is when the grain has begun to glaze, at the time when the lower leaves are turning yellow, and the upper ones are still green. The stalks and cobs are then conveyed to the silo, where they are cut by a combined silage cutter and blower, which chaffs the whole of the material, and blows the chaff up a pipe, which enters the silo at the top. Pea vines are extensively used for ensilage, and these with the local grasses, cane tops, etc., should form abundant material which planters could transform into ensilage for use during pro-

tracted droughts. Burtt-Davy recommends that when stock is fed with maize silage, in order to give balance to the ration, planters should grow a leguminous crop, and mix it with the feed. He mentioned the following plants as being of value for this purpose: velvet beans, cowpeas, and peanuts, all of which thrive in Antigua. In writing on the methods of ensilage the authority quoted above states:—

'Three methods of preparation are in vogue—staking, burying in a pit, and preserving in an air-tight chamber. The principle is the same in all cases, i.e, development of a limited degree of fermentation, followed by the exclusion of air to prevent desiccation and to arrest decomposition. The means of obtaining these ends is to build up a mass of moist vegetation which then begins to sweat. If this sweating were allowed to continue indefinitely "spontaneous combustion" would ensue, and the mass would be spoiled. The most suitable temperature is from 130° F. to 140° F. To prevent increase of temperature above this point fresh material is added. The added weight, tending to compress the lower mass, forces out the air, excludes a fresh supply of oxygen, and thus checks fermentation. In practice it is not necessary to use a thermometer to determine the actual temperature. If the surface heat becomes so great that one can only with difficulty bear to keep the hand in it more fodder should be added to the pit, which when filled should be sealed up: but if it does not get warm, it should be kept open for a few days, and a little water may be poured on to it.'

The above extract should be of use to any planter contemplating the making of ensilage. In addition, it might be added that some authorities state that ensilage is improved by the addition of salt at the rate of 1½ lb. to every ton of green material. A cubic foot of silage is reckoned a daily ration for a cow in milk. The *Missouri Farmers' Bulletin*, No. 11, sums up the advantages of silage as follows:—

1. Silage keeps young stock thrifty and growing all winter.
2. It produces fat beef more cheaply than dry feed.
3. It enables cows to produce milk and butter more economically.
4. Silage is more conveniently handled than dry fodder.
5. The silo prevents waste of corn stalks, which contain about one-third the food value of the entire crop.
6. There are no aggravating corn stalks in the manure when silage is fed.
7. The silo will make palatable food of stuffs that would not otherwise be eaten.
8. It enables a large number of animals to be maintained on a given number of acres.
9. It enables the farmers to preserve food which matures at a rainy time of the year, when drying would be next to impossible.
10. It is the most economical method of supplying food for the stock during the hot dry periods in summer, and when pasture is short.

At a recent meeting of the Liguanea Agricultural Society, Jamaica, a committee was appointed to go into the question of communal silos for lower St. Andrew.

The President submitted the following notes, asking if the Secretary would kindly give the benefit of his remarks and advice, which should be received in time to put before the committee of the central Society. The notes are as follows:—

'I think we should first sett'e on a standard silo which I suggest should be of the following dimensions and capacity:

Dimensions:—12 ft. diameter × 40 ft. depth (10 ft. below ground and 30 ft. above).

Capacity—80 tons. Cost—say £100.

(Twin silos of smaller capacity might be preferable to a large one.)

Material—cement concrete reinforced with wire.

Such a silo would provide forty cows with 25lb. food per diem for six months.

For the purpose of inviting discussion I suggest communal silos with capital of 10 shares of £10 each.'

,1. That ten freeholders in a locality agree among themselves to select a site for a silo.

2. Each to subscribe not less than £5, thus securing one share.

3. Each to agree to cultivate and reserve not less than 2½ acres in guinea grass, or good ploughable land for silage crops.

4. The Capitalist, Building Society, or Loan Bank, to provide the balance of unsubscribed capital, and arrange for the erection of the Silo.

5. The cost of erection to be a first charge on the properties pro rata, and the Capitalist, etc., to be so secured.

6. The 2½ acres of land must be ear-marked to each share, so that, if a share is transferred, the right to cultivate that land must go with it.

7. In the case of an encumbered freehold the benefits of the communal silo would, I am of opinion, be sufficient inducement for the mortgagee to become a joint shareholder with the mortgagor, and to put up the other £5 due on the share.

8. That His Excellency the Governor be asked to authorize the erection of the silos under the supervision of the Public Works Department.

Coco-nuts and Vanilla in Nevis.—It is stated in the Report of the Agricultural Instructor, Nevis, for 1917-18, that the coco-nut plantation at Pinneys estate continues to do well, and the trees continue to bear abundantly. Unfortunately the manurial experiments had to be discontinued on account of the difficulty in procuring manures.

The total number of nuts reaped during the year was 138,000, which were practically all sold in the local market and in the neighbouring islands. The nuts are used chiefly for making coco-nut cake and coco-nut oil, which is now largely used in the place of lard for frying fish, etc.

The plantations at Paradise and Jones estates are also doing well. Coco-nuts are also planted on the coast lands on Stoney Grove, Round Hill, and Cliftons estates. These young plantations are all doing well, and are, on the whole very promising.

There are at present over 500 acres planted in the island, and the cultivation is extending every year.

The vanilla at Maddens estate continues healthy, and a good crop of beans was reaped this season. The crop was nearly 1,000 lb. of cured beans.

Trials were made in sunning the beans under glass, instead of placing them directly in the sun. This method is giving very satisfactory results.

WEST INDIAN COTTON.

The following information concerning the change in the situation of West Indian Sea Island cotton has been furnished by the British Cotton Growing Association under date of July 22, 1919.

Owing to the ravages of the boll weevil in Georgia, South Carolina and Florida, the situation of West Indian Sea Island cotton has completely changed. The Sea Island crop grown in the United States, which formerly amounted to from 80,000 to 120,000 bales, is not expected to exceed 30,000.

The larger consumers who took over the Government supply of West Indian cotton hold considerable stocks, but under the changed circumstances, we have no doubt they will continue to buy. Meanwhile, the smaller users and also the French spinners are without a supply, and are eagerly enquiring for the better qualities of West Indian.

The new address of the British Cotton Growing Association is 330-350, The Royal Exchange, Manchester.

JAMAICAN SUGAR INDUSTRY.

The following extract is taken from the *Louisiana Planter*, for August 2:—

Jamaica's hope for a state-owned central factory has at last been achieved, through the members of the Legislative Council unanimously passing a vote for £220,000 to provide a 5,000-ton factory in eastern St. Thomas Parish, and the necessary extra railway needed to connect with the factory.

It seems almost unbelievable that after all the trouble taken to get the vote to establish this most needed economic venture for St. Thomas, we learn that most of the large landowners in the parish prefer still to put their faith and cash in the frail chances of banana and coco-nut cultivation; and as if Kismet were on their side, competition in the fruit trade has quite recently secured better prices to the banana man. It seems somewhat cruel to suggest, but still it is said, that if an unusually severe tropical hurricane visits Jamaica this year, and happens to strike St. Thomas, it will not only wipe out the fruit trade, but all the clinging faith of the banana planters also, and Jamaica will start fair with enough cane contracts to justify the erection of a 10,000-ton plant, instead of the 5,000-ton one now voted for.

As far as we have gone, there are a number of small cane growers in the vicinity who are willing to enter into the projected contracts, guaranteeing about 600 acres. The United Fruit Company has also promised to plant out 1,000 acres in cane for the factory. The districts of St. Thomas were visited by Sir Francis Watts while he was in Jamaica some years ago, and in his opinion they offered great possibilities for the cultivation of sugar-cane Despite the lukewarm interest shown by the large land-owners, however, we are optimistic enough to prophesy that as soon as the factory is started we shall have contracts showering in. The machinery, it is understood, will be ordered from the United States of America.

The agreements, which the contractors are asked to sign, are of the usual length, and deal with numerous points, but they seem to cover all that is necessary to bind the contracting parties, and cover protective measures on either side.

Besides this advance in cane interests in the island, reports come from Trelawney that the estates Hyde Hall, Long Pond, and Content are to be merged into one estate with a central of 2,000 tons capacity.

With the sanction of the Legislative Council the Government has power to purchase fifty cane cars from Messrs. Keeling, Lindo, Bros., while provision was also made to considerably increase the rolling-stock of the Government Railway.

Far greater interest in the problems of sugar manufacture is noticed daily in this little island making such strenuous efforts once again to hold her own in the sugar-making world. We have one writer impressing upon us the 'need of scientific knowledge in the making of sugar' and pointing out 'why research work in these days is of the utmost importance.' Mr. Twiney, the writer of the article, does not seem very optimistic as to the benefits to accrue to us from imperial preference, for he remarks: 'Imperial preference, then, is very far from implying that Jamaica will receive an assured position in the English sugar market. Even assuming that the preference reaches the producer (for some, if not all of it, will probably remain in the hands of merchants, shipping companies, and other middlemen) the sugar planters in Jamaica must still be prepared to meet the fiercest competition. The days when cane sugar was supreme, with rivalry undreamt of, will never return.

'The one thing that raised beet sugar to the position it held before the war was the work of the technical chemist; and the only thing that will place cane sugar in an equal or better position is likewise the work of the technical chemist. The manufacturer who aims to produce sugar in these present circumstances without the help of a proper technical staff, is foredoomed to failure. Fortunately there is some realization of this fact, as evidenced by a proposal that came before the Legislative Council for the appointment of an industrial chemist, and the awarding of scholarships to suitable candidates to be trained as sugar chemists. Yet it may be doubted whether the more common view of the subject is not rather utter indifference, due to a complete ignorance of the nature and scope of the work of a technical chemist' The writer is justified, however, in pointing out the necessity of technical chemists, and keeping the up to-date and clearly proven facts of running sugar manufactories on scientific knowledge before the Jamaica sugar planters; so very few of them seem to realize the benefit and vital necessity of these expensive appendages, if they are to compete with neighbouring rivals. From sentimental reasons many of the proprietors prefer to continue running their small plants, instead of combining and establishing centrals which could stand the cost of scientific control and up-to-date methods, and again so few of the proprietor sugar planters will cut loose from the old and worn-out methods of the old regime.

'When this reaches print most of the sugar estates will have ceased to grind; in the western parishes the factories are mostly all silent. In Vere the estates are making up for those days when they had to shut down in May, owing to the damage to roads and bridges from the excessive rainfall in that month. Ideal weather is with us for the 1920 crop now in the ground, but it is also ideal for the 'tares'. The problem of cleaning canes grows apace, and the labourer is refusing task work, and of course, only does a comparatively small amount of work for his day's pay, which continues to be 1*s*. 6*d*. per day. There is much talk, however, of a Labour Bureau here, but this will take time to materialize, as so many are against the idea, claiming that it will be an unnecessary expense to the island, but the Governor has appointed a committee to enquire into the practicability of such an undertaking.

'It is quite impossible to send reliable sugar figures, and I prefer to believe that the indifference to contribute data by the several managers is from a natural conservative reserve, and not from their being ashamed of their returns, as was suggested by one of the local planters recently.

'The Frome Factory in Westmoreland has broken its previous record in sugar output. The proprietor, Mr. Charley, and his attorney, Mr. Hudson, belong to the new school of ideas, and rumour has it that extensive improvements are to be made in their distillery for the coming crop; also that a new vacuum pan will be installed, and many other adjustments are spoken of, which will bring up the factory to the needs of the 1920 crop.

With a guarantee of the necessary labour required, Mr. Charley's estates would go under many more hundred acres in cane, but the management have to hold their hands, in view of the present shortage of labour, and the ill-prospect of this problem in the future.'

TRAINING IN SUGAR TECHNOLOGY IN HAWAII.

In view of the activity which is now being shown in regard to the establishment of an Agricultural College in the West Indies, the following article, which appeared in *Science* for June 20, will be read with interest. The writer is Mr. Vaughan Urac Caughey, of the College of Hawaii.

Hawaii leads the world in her applications of science to the production of cane sugar. In no other country is the cultivation of cane so highly developed, the extraction so high, the chemical control so thorough, the mill processes so accurately co-ordinated. The entire organization of Hawaii's sugar industry is unparalleled for business efficiency and scientific control.

The experiment station of the Hawaiian Sugar Planters' Association is recognized throughout the world for the high quality of its investigational work. Its resources are large, varied, and unique. It has a large staff of trained research men working in the various branches of sugar production.

The College of Hawaii has a standard four-year course in sugar technology. The College of Hawaii is the territorial college of agriculture and the mechanic arts. It corresponds in general status and organization to the state colleges and universities of the mainland. A number of its graduates are now actively engaged in the sugar industry.

The courses in sugar technology are designed primarily for the student who, on leaving college, intends to enter into active service in some branch of the sugar industry. Although these courses, since they prepare for one particular industry, might be termed highly specialized, the importance of a sound training in general science has not been overlooked, the first two years being devoted largely to English, mathematics, physics, and chemistry.

In the third and fourth years enough special instruction in subjects pertaining directly to the sugar industry is given, so that the man who completes this course should have sufficient technical understanding to prove of some immediate value in a subordinate position on a plantation, and yet not have his future progress hampered by an inadequate theoretical training.

The cane sugar industry, as carried on in the tropics, comprises in itself two quite distinct branches; the growing of cane, and its manufacture into sugar. Inasmuch as it would be extremely difficult, if not impossible, to give thorough instruction in both these branches in four years, the courses in sugar technology are offered in two divisions.

AGRICULTURAL DIVISION. The first two years are identical with the course in agriculture. In the third year quantitative analysis and organic chemistry are taken up in addition to strictly agricultural topics, for the reason that sugar production is probably more dependent on chemistry than is any other branch of agriculture. Sugar analysis is also required, as familiarity with this work is often required of a field chemist. The fourth year allows a liberal amount of electives to those students who wish to specialize on some one subject. The lectures on cane sugar manufacture are required in this year, as it is desirable that the agriculturist should have some knowledge of what happens to the cane after he has grown it.

ENGINEERING DIVISION. The first year is identical with the course in engineering, while the second year differs only in the substitution of qualitative analysis for advanced mechanical drawing. Chemistry is continued in the third year, together with the most essential of the engineering subjects. Students in this division take sugar analysis and sugar manufacture, together with those of the agricultural division.

During the summer vacation, between the third and fourth years, a minimum of eight week's work on one of the plantations, or in connexion with the work of the experiment station of the Hawaiian Sugar Planters' Association, is required of students in both divisions. To obtain credit for this a written report of work performed is required.

The second semester of the fourth year is devoted almost entirely to practical work. Arrangements are made whereby students either serve a special apprenticeship on a plantation, where under direction they actually perform the manual labour required at the various stations of the mill and boiling house, or else they work as assistants to men carrying on the experimental field work of the experiment station.

Students are required during this apprenticeship to take careful notes of the equipment necessary, time required, and labour involved in each operation, and will meet at stated times for discussion and comparison of notes, with a view toward fixing the relationship between the theoretical principles previously studied and their practical application.

CO-OPERATION BETWEEN COLLEGE AND STATION. An important agreement has been effected recently between the college and the sugar planters' station, the essential points of which are as follows:

1. The station accepts College of Hawaii students in sugar technology for a 2-3-month period during the summer, or a 4-month period during the winter and spring. These students serve in the capacity of assistants to the field research men of the station.

2. These student assistants are appointed by the college. The college receives reports from the students, but publication rests with the station director.

3. The station pays each student assistant $45·00 per month, and pays actual transportation expenses while travelling on station work.

4. The programme of work for the student assistants is of a practical nature, but with due regard to the educational features involved. The president of the college co-operates in arranging the programme

Under the provisions of this agreement, College of Hawaii students in sugar technology have remarkable opportunities and facilities for first hand familiarity with Hawaii's sugar industry.

TAPPING CUTS IN RUBBER TREES.

In the early days of rubber tapping it was customary to have a very large number of tapping lines on each tree. Year by year the number has been gradually reduced, and at the present time it is customary to have only one tapping cut on young trees, and at the most only two cuts on old trees, the length of each cut varying generally from one-quarter to one third of the circumference of the tree. Experiments have been made by Mr. Petch in Ceylon with the object of determining the yield from one cut as against that from two cuts on the same tree. The experimental trees were divided into two groups; each group was tapped on opposite quarters, one quarter having one cut, and the opposite quarter on the same tree two cuts. The difference in the two groups was that two cuts in group I were 1 foot apart, and in group II, 2 feet apart; the yield from the one cut and from the two cuts in each group are given separately. We cannot help thinking that it would have been much better if the experiments had been differently arranged and simplified. It should surely have been possible to arrange for similar trees to be arranged in two groups, one of which could be tapped with one cut only, and a second group with two cuts. The present experiments, while giving information as the yield from one cut on one side and two cuts on opposite sides of the same tree, do not give a parallel to modern methods. It is now very rare to find two opposite quarters on the same tree carrying a total of three cuts; furthermore, the fact that each tree in these experiments is being drawn upon by more than two cuts must have some effect on the specific yields given in the report before us. The experiments have so far only been recorded over a period of one and a half years on two groups, each of twenty trees. The following yields have been obtained:—

Group I (which had one cut on one quarter and two cuts 1 foot apart on the other) gave yields in the ratio of 100 for the single cut on one side, 98 for the lower cut on the two-section side, and 43 from the upper cut on that side. The yields, therefore, from the two bottom cuts on opposite sides are almost identical, while the yield from the upper cut, 1 foot above the lower, was only half that of the lower cut.

The second group, where on the two cut section the tapping lines were 2 feet apart, gave the following ratio of yield:—100 for single cut on one side only, 110 for the bottom cut on the two-section side, and 55 for the upper cut on that side. In that case, therefore, the bottom cut on the two-section side gave a higher yield than the single-section on the opposite side, but the upper cut gave only half the yield of the lower cut

The fact of importance which one learns from these experiments is that on the side carrying two cuts the upper cut gave a yield of about only half that of the lower cut. The author agrees that it is possible to have trees which yield more rubber from one side than from the other.

Mr. Petch does not, of course, offer the results as conclusive evidence of the value of either system, but probably regards the present publication as in the way of an interim report. We hope these experiments will be continued and further results published from time to time. (The *India Rubber Journal.*)

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. Mr. W. N. Sands, Agricultural Superintendent, states that during July, work in the Experiment Station comprised the collecting of cotton stainers from early May-sown cotton plots. Commercial strains and selections of Sea Island cotton were sown during the month. Cotton seed was distributed. From the Botanic Station 100 cacao plants were sent out. Work in the gardens consisted of the sowing of nearly 50 coco-nuts in the nursery and general routine work. Concerning the condition of the staple crops it is observed that the good rains received caused all crops to make excellent progress. The special work of the officers of the department during July was considerable. The Superintendent visited Camden Park estate with the owner in connexion with cotton and sugar-cane. In regard to pests the green bug (*Nezara viridula*) was found attacking the young fruit of the castor oil plant growing wild near to fields of young cotton and black eye peas. The destruction of the castor oil plants which were of no value was advocated. The Superintendent also inspected cultivations at Clare Valley Questelles estates and lands offered for sale to the Government there. Cotton planting was receiving much attention, and although late the young crop was making good progress. The interplanted corn was poor, in most cases due to dry weather circumstances, attacks of the blackbird (*Quiscalus fortirostris*) on the forest seedlings. Advice as to the planting and protection of the corn was given. Another visit was that paid to Ratho Mill and Villa estates. At the former the 12-acre field of a selected strain of cotton from the Experiment Station which is being grown for the department was inspected. At Villa, matters respecting cotton and the control of pests were discussed. The Agricultural Superintendent wrote a leaflet concerning the cotton stainer and the mixing of ashes with cotton-seed meal for manurial purposes. This will be published in a future issue of the *Agricultural News*. The Foreman of the Experiment Station visited Cane Garden, Arnosvale and Fountain estates and the Land Settlement estate of Belair on the 9th, Mesopotamia and Richmond Park on the 11th and Owia estate from the 17th to 19th. The private estates were visited for the purpose of cotton stainer inspection. This showed that at Cane Garden the pest was present in small numbers and was being controlled. Mesopotamia and Richmond Park were inspected for food plants of the cotton stainer. Owing to unfavourable weather conditions the inspection was not thorough enough and no food plants were observed. The condition of the young crops at Belair was satisfactory. The rainfall at the Botanic Station was 11·01 inches; at the Experiment Station, 11·19 inches.

DOMINICA. From a statement received from Mr. J. Jones, Agricultural Superintendent, it is learnt that during July, work in the nurseries consisted of lifting and packing plants, transplanting lime seedlings, potting plants and sowing seed. At the Lime Experiment Station 130 barrels of ripe limes were picked during the month. The total for four months is 202 barrels of ripe limes and 122 barrels of green limes. Two and three-quarter acres of land which had been hoed and drained during the dry season were planted with 275 lime plants. Plant distribution was as follows: limes, 10,850; vanilla, 2,500; cacao, 122; budded citrus, 68; grafted mangoes, 1; nutmegs, 10; miscellaneous,

11. This gives a total of 13,562. Vegetable seeds sold amounted to 204 packets. In the Botanic Gardens a number of specimen plants were placed out during the month. The agricultural pupils left for their midsummer holidays on the 5th and returned on the 21st. The local price for both fresh and ripe limes remained unchanged at 6*s.* per barrel. The price of raw juice rose from 9*d.* to 10*d.* per gallon. At the time of writing Mr. Jones states that concentrated juice was at £42 10*s.* per pipe. He adds, 'if the crop, which is now commencing, can be sold on this basis, planters will receive some compensation for the many difficulties which they have had to face during recent years.' The considerable demand for lime plants during the month indicates a resumption of interest in planting. It is observed that cured cacao is in good demand at 16c. to 19c. per pound. At the beginning of July the long drought on the south-leeward coast broke up, and ample rains fell. The rainfall at the Gardens during July was 12·64 inches, or nearly as much as the total rainfall for the previous six months.

MONTSERRAT. Mr. Gallwey, the Acting Curator, reports that during July the low yield of cotton from breeding plot No. 4 was due to boll shedding consequent on dry weather. A plot of Patchouli plants was planted out. Plant distribution consisted of 1,800 bay plants, and a certain amount of ajowan, papaw, pea, and bean seeds. The death of another royal palm showing symptoms of bud rot is recorded. The bay trees at Roaches are stated to be making luxuriant growth, and the erection of a still is under consideration. Cotton stainers were observed in limited numbers. During the month the Acting Curator visited several estates. A quarterly meeting of the Agricultural and Commercial Society was held during the month. The rainfall at Grove Station for the month was 3·59 inches. The heaviest fall was ·75 inch on the 25th. Total for the year, 26·73 inches

BARBUDA. Mr. Jarvis reports that during June lands were prepared for the new cotton crop. It was intended to plant as soon as rain was received. Stock in the island remained in a healthy condition.

ST. KITTS. Mr. F. R. Shepherd, Agricultural Superintendent, forwards the following observations on the work of the Department for July. At the Experiment Station two varieties of guinea corn from Anguilla were planted for the purpose of testing their alleged toxic qualities. Sulphate of ammonia was applied to the sugar-cane plots. It is stated that good rains have much improved the general appearance of the gardens. The Basseterre sugar factory finished grinding early in the month. It produced 8,814 tons of crystals from 81,078 tons of cane. The heavy rainfall in April was responsible for the increase in the tonnage of canes per acre. Two estates in the northern districts produced at the rate of 26 tons of cane per acre in plants and ratoons, and the average return of that district was 22 tons. In the Valley or Basseterre district, the returns were from 15 to 20 tons of cane per acre. The average return from the estates connected with the factory will be from 18 to 19 tons per acre. The young cane crop is well advanced, and is responding to the application of artificial manures. The cotton crop is stated to be all that can be desired. In the northern district during the month picking was in full swing. The rainfall for the month was 7·26 inches; for the year 27·12 inches. Appended to Mr. Shepherd's observations is a short summary of the work done at the St. Kitts Government Chemical Laboratory. This consisted of the analysis of fourteen samples of milk from the Inspector of Police; the analysis of thirty-seven samples of fancy molasses; the determination of nitrogen in three samples of sulphate of ammonia; the analysis of one sample of slaked lime; and an examination of two samples of gasolene.

AGRICULTURE IN BARBADOS.

On August 9, the *Agricultural Reporter*, Barbados, published the following observations on the present outlook for cane planters in that colony. Since the article was written, however, the island has received good heavy rains which make the prospects for next crop much more favourable:—

In the hilly districts, the change in the cane crops, which we noted in our last report, continues, and some of the forward ratoons have materially recovered during the past fortnight. The plant canes, in most cases, are taking a longer time to revive. This was to be expected. In those fields which have been extensively stumped, a long period must elapse before anything like progress will be noted. We observe that on some black soil estates in St. Philip and St. George stumping is still being done. That this work is still unfinished shows to what an extent the young cane crop had succumbed to the severe weather, although the lack of continuous showers may, in some instances, have delayed the taking in hand of some fields at an earlier date. In some districts the backwardness of second ratoons has caused some planters to fork them before putting in the second application of sulphate of ammonia. This has been done in order that the light rains may more easily penetrate to the roots, and thereby induce a more rapid growth. It has been fairly well agreed that this tillage has but little effect on the yield: it would probably stimulate growth.

As was to be expected, there are a large number of diseased shoots in the plant canes and, in a few instances, we have seen men engaged in cutting them out. We believe that this is not considered advisable. Experience has shown that it reduces the yield. So far as we remember, the Government Department of Agriculture does not recommend it, and a practical planter has informed us that he has, by experiment, proved that the removal of such shoots lessens the return.

The condition of the crops in the major part of the black soil is what it was at the date of our last report—trying to exist and no more. The passing of each week points clearer and clearer to the failure of next year's crop. In some fields it can hardly be said to have been established at all, and some of the fields of forward growth have shrivelled, until now in some instances only one or two green shoots remain in the hole. This picture is not overdrawn. The present stage of the fields would cause one to think that we were just now in the early weeks of the reaping season.

This year the question of material for the making of manure for the next planting season is causing planters some anxiety. Not only was the fall of tops a very small one, but estates have had to feed their animals on the trash, and the pastures up to the present have yielded but little. There has also been a very great scarcity of cane shoots. The shoots have grown very irregularly, and those that did grow have not developed to any extent. We have heard of an estate cutting 6 acres of shoots, and failing to obtain from this acreage a sufficient supply for one day. On this same estate last year at this same time shoots were being, so to speak, wasted in order to clear sufficient land each day for cane-hole digging.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*
**Seconded for Military Service.*

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with the status of agricultural officers and it is maintained that their position should be raised on account of the changed character of their activities.

On page 270 will be found a review of the Report on the Agricultural Department, St. Kitts-Nevis, 1917-18.

An article on cacao production in the British Empire appears at page 267.

Insect Notes in this issue deal with bean and pea weevils. This is the first part of an article which will be concluded in the next issue of the *Agricultural News*.

Eat Less Rice.

The Government of Trinidad has issued an appeal with the object of reducing the present rate of rice consumption in that colony. This arose from a circular telegram, received from the Secretary of State, pointing out the great shortage of rice in eastern countries. As is generally known, of the 60,000,000 tons produced in the world only 10 per cent. is available for export. Those countries therefore, which import large quantities will, in years of low production, feel the shortage first. British Guiana, and to a less extent Trinidad, produce large quantities of rice. Under the present circumstances of a general world's shortage, however, it is still incumbent upon these colonies to exercise economy as regards local consumption.

The Recent Atmospheric Disturbances.

On August 7 a disturbance passed west of Barbados, travelling in a northerly direction. Strong southerly winds were experienced, and two schooners were driven ashore in Carlisle Bay. The barometric readings were not abnormally low. At the time of writing (August 18), during the past week, the barometer has been high, in the neighbourhood of 30·40. There have been heavy and frequent showers of rain.

In connexion with the atmospheric disturbances on August 7, and the rough weather that was experienced in St. Lucia, and Dominica, it may be desirable to place on record the barometric and other data obtained in St. Johns, Antigua, which have been supplied by Mr. A. E. Collens, F. I. C., acting Chemist and Superintendent of Agriculture for the Leeward Islands.

The barometer readings corrected to 0°C. and sea-level were as follows:— August 7, 3 p.m., 30·011; August 8, 10 a.m., 30·033; 12 a.m., 33·039; 1 p.m., 30·021; 2 p.m., 30·017; 3 p.m., 30·000; 4 p.m., 30·004.

Up to 12 a.m. on the 8th, the wind was from the north-east, and gusty; sky overcast, with showers. After 12, the wind veered east, and about 12 30 was east-south east, remaining so till about 3 p.m., when it set south east, but dying down. At about 5.30 p.m. a sharp vivid flash of lightning occurred in the west—no thunder audible,—and shortly after 5.50 p.m. very heavy rain fell. No further lightning or thunder was observable. From 6.30 the weather was calm. During the night of the 8th, slight southerly breezes were experienced, with slight showers.

High winds were reported on August 10 from Fitches Creek, English Harbour, and Jolly Hill, but in town there was nothing to report, except cool north-east breezes. The barometer remained high at 30·06.

Swine Fever and Hog Cholera.

A correspondent has written from Ecuador, saying that he has been trying to raise pigs in the tropical zone of that country, but so far without success, owing to the animals dying. It is not stated what is the cause of the deaths, but we may suspect hog cholera. If that is the case there should be some hope of

controlling the disease by serum treatment. A full account of hog cholera or swine fever will be found in the *West Indian Bulletin*, Vol. XVII, No. 3. The trouble is, however, that there is more than one disease which may be confused with swine fever. This makes diagnosis difficult, and specific treatment uncertain. For instance, there is hemorrhagic septicæmia or swine plague. It is very difficult to distinguish swine plague from hog cholera. H. J. Washburn in *Farmers' Bulletin*, No. 1018, United States Department of Agriculture, states: 'the two diseases may actually occur in the same animal. Should the outbreak seem to be but slightly contagious, and not inclined to spread from the premises upon which it first appeared, it is probably not hog cholera, but if it spreads rapidly throughout the neighbourhood, it is undoubtedly due to hog cholera infection. The presence of the characteristic bacilli does not alone establish a diagnosis of swine plague, since those organisms are found frequently as secondary invaders in true cases of hog cholera, and again they are often present in the noses or throats of healthy swine.'

Outbreaks of contagious diseases in swine, therefore, require very careful investigation. Those people who are concerned with pig raising in the tropics would do well to obtain information as to the methods adopted in Cuba, where hog raising has now reached large proportions, and has attained to a high degree of efficiency.

Soil Deficiencies.

In articles which have appeared in previous issues of the *Agricultural News* during the present year it has been pointed out that the deterioration in the yield of crops is very often primarily due to the conditions of soil, more than to attacks of insect or fungus enemies, which may be considered rather as a sequel to soil deficiencies. For instance, it has been pointed out by Mr. W. Nowell that probably the best means of combating the froghopper pest of the sugar-cane will be to pay more attention to the condition of the soil. The late Mr. Farquharson of Nigeria also emphasized the necessity of improved cultivation for the well-being of the cacao cultivation in West Africa.

A paper recently read by Professor H. E. Armstrong at a meeting of the Society of Arts dealt with the subject of soil deficiencies in India. In the course of his paper Professor Armstrong laid stress on the effect which the deficiency of any one ingredient in the soil necessary to the health of a plant may have upon its life. With regard to phosphorus for instance, and its frequent deficiency in tropical soils, his remarks are worth attention by all interested in tropical agriculture.

As an instance of how the supply of this ingredient to soil deficient in it has led to great results, Professor Armstrong adduces the case of some lands in Australia, on which, after clearing, it was found impossible to grow wheat, but the application of a small amount of phosphatic manure led to productive crops of this cereal.

With regard to tropical cultivation, Professor Armstrong is of the opinion that the forced abandonment of coffee cultivation in Ceylon may have been really due to soil deficiency, which enfeebled the plants, rendering them an easy prey to the attacks of the leaf fungus. He goes on to utter a warning that what happened to coffee in Ceylon may possibly well happen to rubber, not only in that island, but in other places.

It seems to be worth while for planters of other tropical crops, such as limes for instance in the West Indies, carefully to investigate the conditions of their soils, with a view to supplying any ingredient lacking in them necessary for the proper development of the particular crop cultivated. In this direction the scientific assistance of the various agricultural departments will surely be readily available, if sought for.

The Aeroplane for Surveying.

The Director of the United States Coast and Geodetic Survey has written an article to *Science* (June 20) on the coming use of the aeroplane (or airplane, as it is spelt in America) for purposes of surveying and mapping. The principal application will be for photographic purposes. It will be possible to make very rapid surveys of interior tracts of country by means of aerial photography, and to show accurately and in detail the position of every topographical feature. Much has been done during the war to advance aerial photography, and the possibilities it offers for geographical work in peace time will cause the advancement to be energetically prosecuted. Research concentrated on the camera, rather than on the aeroplane or airship seems to be what is most urgently required. Some method of ensuring that the camera is perfectly vertical at the time of exposure will be necessary; that is, a method of regulating tilt, for tilt has the effect of causing distortion.

Aerial survey will be of immense value in the agricultural development of such territories as British Guiana, British Honduras, and the great African possessions. With greater perfection of the camera it should be possible to illustrate the vegetative characteristics of a country from an airship at low altitudes. Possibly also cinematograph films could be taken.

Another use of aerial photography will be for the location of dangers to navigation. Altogether, the use of airplanes for survey work offers immense possibilities, as it also does for communication between inaccessible places. It is a matter for surprise that no attempt is being made to introduce aerial transport and survey work into the great tropical territories, which contain abundant resources to repay at no distant date the initial expenses incurred.

Since the above was written, a recent issue of the *Journal of the Royal Geographical Society* (for June) has come to hand containing a most valuable paper on mapping from air photographs by Lieut.-Col. Macleod, D.S.O., R.E. This paper, which is illustrated with remarkably fine plates, shows that in the subject dealt with great progress has been made in England. It would seem that the American writer is not familiar with this progress.

INSECT NOTES.

BEAN AND PEA WEEVILS.

Stored grains and cereal products are subject to attacks by several kinds of insects in the Tropics, to such an extent as to interfere seriously with the growing of these crops. The planter does not care to grow large quantities for storage because the loss from weevils is so great.

As a safeguard against a certain amount of such loss there have been established in Antigua and St. Vincent, under Government control, drying machines in which Indian corn has been conditioned. In St. Vincent in particular, maize has been treated for the purpose of drying out excess moisture, and thereby preventing the growths of moulds and mildews, and also for the purpose of killing the insects in the grain. This, with proper arrangements for storage in insect-proof bins, constitutes a measure of protection against insects and fungi in stored grains, and it may be applied to those species which infest peas and beans, as well as the 'weevil' and other pests in maize. The trouble experienced in storing seeds and grains is not confined to tropical regions. All temperate countries have the same trouble in greater or less degree.

The United States Department of Agriculture recently (September 1918) issued *Farmers' Bulletin*, No. 983, entitled Bean and Pea Weevils, by Dr. E. A. Back and Mr. A. B. Duckett, and the Department of Agriculture, Union of South Africa, at the same time issued a similar publication, Bulletin No. 12, 1918, entitled Pea and Bean Weevils, by Mr. S. F. Skaife, B.A.

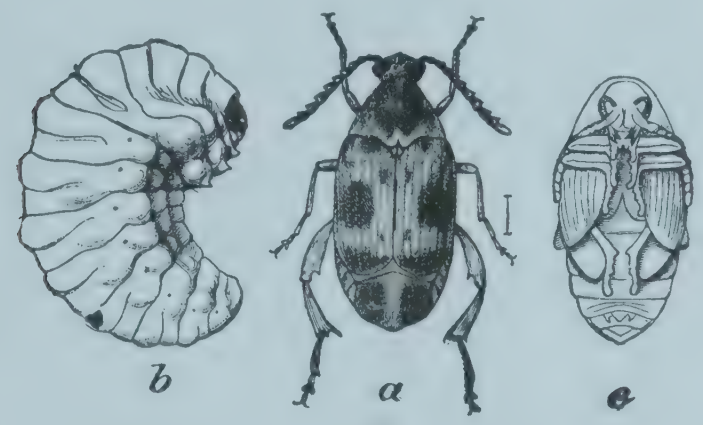

Fig 3. The Four-Spotted Bean Weevil. (*a*) adult; (*b*) larva, (*c*) pupa. All enlarged.
(From *U. S. Department of Agriculture.*)

It is significant that at a time like the present, when the demand for foodstuffs is pressing and the need for conservation great that these two great agricultural countries, one in the north temperate and the other in the south temperate zone, should be dealing with the same group of insect pests in order to help the growers and others to save as much as possible of the valuable leguminous grains.

The weevils which attack beans and peas in the West Indies appear to be of three species: the bean weevil (*Bruchus obtectus*), the cowpea weevil, (*B. chinensis*), and the four-spotted bean weevil (*B. quadrimaculatus*). The injuries resulting to peas and beans in storage from the attacks of these insects is usually attributed to weevils, without distinguishing between the several species. It would appear likely, however, that the cowpea weevil is the most abundant in the West Indies. The pea weevil (*B. pisorum*) is sometimes to be found, but it probably is merely imported with peas from northern localities, and does not breed here. Several other species of the genus Bruchus are recorded as occurring in the West Indies, but they do not seem to be known as pests of cultivated peas and beans.

The three species mentioned above as being of importance in connexion with the seed of cultivated leguminous crops are all alike in the essential points of their life-history, habits of feeding, and method of control. They all begin their attack in the young developing pod in the field. The insects in the seed at the time of harvesting continue breeding in storage, and if left uncontrolled will, by successive attacks, completely destroy the seeds.

'Bean and pea weevils, like many other insect pests, pass through several marked changes in form and habits before reaching maturity. The adult weevil that is seen crawling about among the seeds is the parent insect. Many of these fly from the storage room or house to the fields where beans and peas are growing. As the bean and pea pods develop, the mother weevil lays whitish eggs, either on the outside or within the pods. These eggs are so small that they are often not noticed, for they appear as mere white specks upon the pods. From these eggs there hatch white grubs that burrow their way through the pods into the soft developing beans and peas. Because these grubs are so very tiny, the holes through which they enter the seeds are too small to be seen, unless one searches for them with a microscope. Usually beans become infested first when they are nearly full grown. As seeds expand and harden in the final ripening process, the holes in the skin through which the grubs entered become less and less easy to find. The wound in the skin either becomes entirely healed over or remains similar in appearance to a pin prick.

'Since beans and peas mature much faster than the weevil grubs within them, it happens that the weevil grubs are comparatively small or little developed in many instances when the crop is harvested and placed in storage. Thus many seeds that appear outwardly in excellent condition, in reality have weevil grubs hidden away in their interior. (*Farmers' Bulletin*, No. 983.)

In this way the beans or peas become infested, and when harvested they contain living insects which will shortly emerge as adult beetles; these will deposit eggs, and another generation will attack the beans or peas. The injury caused by the first generation of the cowpea weevil and four spotted bean weevil is not very great, but when the attacks are allowed to continue unrestricted during the whole time these seeds are in storage they may be entirely destroyed. Although cowpeas are the preferred food, most kinds of peas and beans are attacked. The *Farmers' Bulletin*, No. 983, mentioned above, gives the following list of food plants for the cowpea weevil: – cowpea, common pea, pigeon pea, lentil, chick pea mung bean, and common white bean In this list the mung bean is the woolly pyrol of the West Indies.

Nearly every one who has kept seed of leguminous plants for any length of time in the West Indies knows the effect of the work of these insects. From a monetary point of view the loss is greater in those districts, particularly in the temperate climates, where large areas are grown in leguminous crops for sale and shipment to the markets of cities and towns. The Bulletin (983), already mentioned, states that 'One Province of Canada alone suffered from ravages of the pea weevil to the extent of over $1,000,000 in a single year. It was estimated in 1992 that the acreage of field peas in Ontario would have been 1,000,000 instead of the 532,639 actually planted, had it not been for the fear of the pea weevil.'.

The situation in the West Indies is more comparable to that existing in the Southern States, where cowpeas are cultivated for their great value as soil covers and soil improvers, as well as for use for fodder, and where the acreage grown under this crop would be probably very much greater, but for the serious losses resulting from the attacks of these weevils.

These notes will be concluded in the next issue of this Journal.

CACAO PRODUCTION IN THE BRITISH EMPIRE.

A comprehensive article on the above subject showing the relative importance of the cacao industry in the different colonies, the prospects of extension, and the countries of consumption has been published in the *Bulletin of the Imperial Institute,* Vol. XVII, No. 1, January-March, 1919.

The importance of cacao as a world's product is shown by the circumstance that in 1916 the production was nearly 300,000 tons. The countries that contributed chiefly to this production were, in order of importance, the Gold Coast, Brazil, Ecuador, San Thomé, Trinidad, San Domingo, and Venezuela, each responsible for a supply exceeding 14,000 tons. Reference is made to the old cacao-growing countries, like Haiti, Dutch Guiana, and Martinique, which have now lost the importance they possessed many years ago. In regard to the consumption of cacao, it is stated that the present high rate was originally due to a discovery in the years immediately preceding 1830 of a method for separating the fat of the cacao bean, called cacao butter so as to produce a powder that could be readily mixed with milk or water. The new invention not only improved the cocoa, but, what is more important, made it cheaper, and therefore enormously increased its consumption.

The article gives a general account of the varieties grown, and describes the general process of fermentation. But the most useful part of the article is the statistical part, which gives the production and consumption in different countries. The table on page 47 shows that the production (estimated) on the Gold Coast during 1917 was 1,819,280 cwt. The estimated production for the whole of the British Empire during 1917 was 2,857,500. The total world's production (estimated) was 6,628,000. It is interesting to note in this table the importance of Nigeria as a cacao-producing country. The production there in 1917 was estimated at over 300,000 cwt. which is about half the estimated production for Trinidad, and puts Nigeria, next to Trinidad, which Colony is the second largest cacao-producing country in the British Empire.

Turning to the notes on cacao-production in the individual colonies and protectorates, reference is made first to the Gold Coast. Under this heading it is stated that the variety of cacao in general cultivation on the Gold Coast is Amelonado. It is significantly stated that the variety called Cundeamor by the officials of the Department of Agriculture is only due to its outward resemblance to a Ceylon type of that name. However, the beans from this type have proved superior to the fine fermented Accra cacao. Cundeamor is now being sought after by the natives, and in time considerable areas should be planted with it. In dealing with varieties it is to be regretted that the writers of the article have not discussed the question of the susceptibility of the Criollo types, and their alleged gradual disappearance from cultivation.

In Nigeria, the article goes on to say, much success has been obtained through the use of artificial driers. Cacao cultivation has become an important industry in Nigeria and when the newly planted areas come into bearing, and as planters become better acquainted with the proper way to cultivate the crop, it is anticipated that a very considerable increase in the exports will be shown. In the remaining African colonies and protectorates cacao growing is not an especially important industry.

The article gives a good deal of space to the discussion of cacao production in the West Indies. Reference is made to the uniformity of Trinidad cacao, and the excellent prices it realizes. It is noted that cacao production in Jamaica is somewhat less than that of Ceylon, namely about 65,000 cwt. Jamaica cacao is stated to be largely of the finer kind, being somewhat similar, but inferior to Trinidad cacao. In general it is believed that in the West Indian colonies other than Trinidad and Grenada, where cacao is the principal crop, the natural conditions, and the large interest at present taken in other crops and products render it unlikely that any consideration may be given to the introduction or extension of cacao growing there. With this opinion we agree.

In conclusion the article under consideration says: 'In the countries where European carefully-supervized plantations are most likely to develop, the West Indies offer a field for some expansion. Ceylon, however, which has the same facilities for perfected cultivation and manufacture, is more interested at the present time in other directions, but may become at any time occupied in the greater extension of cacao growing. Among the British possessions on the mainland of America, when the obstacles in respect to labour and transport are overcome, both British Guiana and British Honduras present suitable opportunities for cacao extension. With regard to the native industry in West Africa, this may extend to vast dimensions, but is in an unstable condition, easily injured by temporary adverse circumstances, for which reason it requires to be most carefully watched.'

The remaining sections of the article under review deal with the world's consumption of cacao, and, the cacao trade of the British Empire. The United States easily heads the list as the largest consumer of cacao, and, before the war, the next largest consumer was Germany. What the future consumption in the Central European countries is likely to be is not stated, though this must necessarily have a considerable amount of influence upon trade and prices in the immediate future. No doubt it is hoped that Great Britain may increase her imports of raw cacao from the British Empire and re-export it in the form of manufactured cocoa and confectionery to other countries.

The indigo of Nigeria and its value as a dye, is dealt with in the *Bulletin of the Imperial Institute* for January-March, 1919. The native indigo plant of West Africa is *Lonchocarpus cyanescens* (natural order Leguminosae). The percentages of indigotin obtained from various samples have been found satisfactory. Practical trials, it is stated, with well prepared samples of the indigo, would be required, in order to establish its technical and commercial value in comparison with the grades of natural indigo derived from cultivated species of Indigofera. A related species of Lonchocarpus occurs in the West Indies, known in Barbados as 'Spanish ash'.

GLEANINGS.

The exports of gasolene from Trinidad in 1917 were 1,248,098 gallons, valued at £52,863. This works out at approximately 10*d.* or 20c. per gallon. The retailed price for this gasolene in Barbados is about 48c.

According to *Farmers' Bulletin*, 969, United States Department of Agriculture, the seed of horse beans retains its vitality for a long period. In germination tests, seed four years old showed little, if any, deterioration.

Good growth is being made by sugar-cane in St. Lucia according to a recent report. During July the lime crop was in full swing, and the cacao trees were flowering and setting pods.

During July the young cane crop throughout the island of Antigua was in a most promising condition, and should good weather be experienced during the next few months, it is believed that a good crop will be reaped next year.

The monthly summary of animals that have died in St. Vincent again shows a complete absence of anthrax mortalities in that island. The total number of deaths recorded from disease or natural causes was fourteen. The general health of live stock in St. Vincent appears to be good.

Anyone who has a surplus of pineapples can manufacture a beverage which has a good sale on the market. This is known as pineapple cider, and Jamaica exports a certain amount, which sells at 1*s.* 6*d.* per bottle in England. This information is taken from the *Queensland Agricultural Journal* for May 1919.

According to the *Bulletin of the Imperial Institute* for January-March 1919, the commercial value of Java kapok for life-saving appliances is greater than that of Indian kapok, owing to the fact that the Indian fibre contains more sand, leaf, etc. Properly cleaned kapok is really superior in buoyancy to genuine Java kapok of good quality.

Valuable information on the different aspects of poultry-keeping in Mauritius, but more particularly their diseases, is contained in *Bulletin No. 12*, General Series, Department of Agriculture, Mauritius. The bulletin contains useful hints concerning the housing, feeding, and management of poultry. It is illustrated by several plates.

In regard to our editorial in the last issue on the decline of sucrose content in central factory cane, the Antigua *Sun* observes, in relation to Gunthorpe's Factory, that the decline may be due to stale cane, but that the fault is to some extent on the side of the factory, which very often fails to supply the necessary trucks to convey the cane to the mills.

It has been suggested that central factories might be set up in India for the production of refined palm sugar in suitable areas. According to *Nature* for June 5, 1919, Mr. H. E. Annett, Agricultural Chemist to the Government of Bengal, now considers such a scheme would be unworkable in practice, unless the owner of the factory also had his own trees.

A note appears in the *Experiment Station Record*, Vol. 40, No. 4, on sisal in the Hawaiian Islands. It refers to an article in the *Hawaiian Forester and Agriculturist* on *Agave rigida* var. *elongata* and *A. rigida* var. *sisalana* in those islands. An effort to produce a hybrid sisal derived from the two varieties named is briefly noted, together with chemical investigations of the waste products of the industry.

The conclusions to be drawn from *Bulletin No. 83*, Agricultural Research Institute, Pusa, on the progress of the sugar-cane industry in India during 1916-17, are that exotic cane generally leads the way in the matter of yield as compared with local varieties, that is seedlings native to India. In the northern provinces D.74 has given very satisfactory results, while in Bengal B.147 and B.208 are still very popular.

Fig-growing in the South Atlantic States is the subject of *Farmers' Bulletin*, No. 1,031, United States Department of Agriculture. Fig trees thrive on well drained, reasonably fertile soils, containing plenty of humus, and well supplied with moisture. They also require care in tillage to avoid injury to the fine fibrous roots which are characteristic of fig trees. The bulletin contains a useful section on the characterization of fig varieties.

The certificates of the Home Reading Agricultural Course, conducted by the Imperial Department of Agriculture, were distributed to successful candidates in Antigua last July by His Excellency the Governor at the Grammar School on Commemoration Day, the 25th instant. At His Excellency's request, prior to the distribution of the certificates, Mr. A. E. Collens, F.I.C., acting Government Chemist and Superintendent of Agriculture, reviewed the scope and purpose of the courses.

Farmers' Bulletin, No. 993, United States Department of Agriculture, deals with co-operative bull associations. These are formed in the United States by farmers for the joint ownership, use, and exchange of pure bred bulls. The organization also helps its members to market dairy stock and dairy products, to fight contagious diseases of cattle intelligently, and in other ways assist in improving the dairy industry. Perusal of this bulletin will probably prove interesting to many planters in islands like Antigua and St. Vincent, where the spirit of co-operation has become firmly established.

SPONTANEOUS COMBUSTION.

So-called 'spontaneous combustion' in reference to such things in ships' cargoes as coal, cotton, hay, tobacco, and cacao is a subject of considerable importance in the tropics. The *Journal of the Royal Society of Arts* for June 20 contains a paper on the subject, read by Mr. Watson Smith, F.I.C., before the Society. This paper begins by explaining that spontaneous combustion arises by reason of such chemical and physical changes in bodies, mostly consisting of or containing carbon, and under the influence of atmospheric oxygen, that sufficient heat is generated to give rise ultimately to combustion. In a general way the most frequent places of spontaneous combustion occur in coals and not many years ago the German Government, after an elaborate inquiry, declared that more ships were lost through such outbreaks than through any other cause. It is noted that coal, containing throughout its mass pyrites, is most inclined to fire when in a damp state. This should cause certain precautions, such as observations of temperature at certain periods to be regularly taken.

Another substance in which fires may arise through the gradual generation of heat, is quick lime. It is well known that if water be suddenly added to quick lime there is a rapid generation of heat, and this m y be quite enough to set fire to dry material or inflammable substances in close proximity. Owing to its physical properties charcoal is liable to fire. It has been found by experiments that finely ground charcoal placed in a barrel attained a temperature of 75° C. after fifteen hours; after twenty hours ignition took place. This was due to the absorption of oxygen and a certain quantity of water. This circumstance might be borne in mind in connexion with the transmission of seed like cacao or rubber in damp charcoal from one part of the tropics to another. If transmitted in large quantities it should be quite possible for enough heat to be produced to kill the seeds, if not to set fire to the parcel.

The statement that wet cotton is liable to break out in combustion is improbable; but a spark getting into a bale will smoulder for a long time, and the fire eventually occurring will then be probably stated as having been due to spontaneous combustion. Greasy cotton is undoubtedly dangerous, most fatty oils absorbing oxygen rapidly with the generation of much heat. A case is recorded in which a firm received a consignment of Indian cotton damaged with river water, and it was offered for sale by auction. On the auction day, the cooper observed that a number of bales had burst several of their encircling iron bands, and the heating of the cotton was perceptible. Investigation showed that these bales contained an extraordinary proportion of cotton seeds. The germination of the seeds in the bales could not proceed, but the heat produced was enough to cause expansion of the air, and to raise the temperature very nearly high enough to set fire to the cotton.

In the case of tobacco, fermentation is frequently the cause of combustion. Also in the case of ensilage there is some danger of over-heating. Care should be taken in West Indian islands where silos have been erected to institute a proper routine for checking the temperature from time to time. In regard to such substances as dried fish, guano, and bone dust, it is recorded that on one occasion a few hundred tons of such material were landed from a ship at Glasgow, and at once placed in bulk in a store on a stone floor. In a short time the material began to heat internally, and so it was opened out and spread more thinly over the floor by a gang of men, this of course bringing the heated stuff more in contact with the oxygen of the air. While this spreading out was taking place a large quantity of the material took fire, and before extinction could be effected a portion of the enclosure was destroyed.

Amongst the acids the most dangerous are sulphuric acid and nitric acid. As ships' freights, the carboys in straw should be stored with great care, and enclosed either under deck or on deck with sand so that should the safety of the ship demand it, they can be readily thrown over the side.

KOSTER'S CURSE.

An interesting memorandum by Mr. Jepson, Government Entomologist, Fiji, has been received by this department through the Colonial Office. The memorandum consists of remarks and observations on the spread of a noxious weed in Fiji called Koster's Curse and known botanically as *Clidemia hirta*. This weed occurs commonly in British Guiana and in most of the West Indian islands, but it is not a weed that causes, in the West Indies, a serious amount of trouble. A note on the subject appeared in the *Agricultural News*, May 3, 1919. In Fiji, however, it is of a most troublesome character, and what makes matters worse is rapidly spreading into zones which were formerly free from its presence. A gentleman known as Mr. Corbett is referred to in the memorandum as the originator of certain suggestions as to why the weed is such a pest in Fiji and as to measures that might be taken to control the weed. Most of these suggestions Mr. Jepson shows to be impracticable. One point however appears to be definite, and that is the statement that the weed in Fiji is principally distributed by birds known as mynahs. Mr. Jepson considers that the absence of Indian mynahs in the West Indian Colonies is the true explanation of the dormant condition of this plant in those places. It is certain that in the West Indies the weed is not controlled by insect or fungus enemies. Mr. Jepson has recently made an examination of the stomach content of some mynahs shot at Nasinu, with the following remarkable result. Up to the time of writing six birds had been examined, and seeds of *Clidemia hirta* were found in every instance. In all, 14,084, were isolated, or an average of 2,347 seeds per bird. The greatest number of seeds found in one bird was 6,644. There is no doubt therefore from this and other evidence in the possession of the Fiji Department of Agriculture, that mynahs feed freely upon the ripe berries of *Clidemia hirta* and that they are active disseminating agents of the weed in the colony.

Mr. Jepson considers it desirable to draw the attention of other Colonial Governments to the above habits of this bird. Its introduction some thirty years ago into Fiji was done with the object to benefit planters, owing to its supposed insectivorous habits. Mr. Jepson considers that the introduction of this bird to other colonies would be dangerous. The mynah has the reputation of being useful as a tick destroyer on cattle. Careful observation shows, however, that although this bird does settle on the backs of cattle, it is more with the object of catching grasshoppers disturbed by the animal as it grazes than with the object of consuming ticks which, after all, are most commonly found in the inaccessible places of the animal's body.

The suggestion was made sometime ago by a convention of planters in Fiji, that a scientific officer should be sent to the West Indies to discover why *Clidemia hirta* is not a noxious weed in those colonies. On the basis of the statements given above it has been decided that such a course is now quite unnecessary.

ST. KITTS-NEVIS: REPORT ON THE AGRICULTURAL DEPARTMENT, 1917-18.

Mr. F. R. Shepherd's report for 1917-18 on the Agricultural Department, St. Kitts-Nevis, though only just issued, contains a large amount of new and interesting information. At the Experiment Station a large amount of work was done in the matter of plant distribution, large quantities of cuttings of the following plants having been distributed during the year: sweet potatoes, cassava, and sugar-cane. There was also distributed over 3,000 lb. of specially selected cotton seed, together with a considerable quantity of beans, peanuts, and guinea corn. In regard to experiments at the station, the report refers to those conducted with provision crops. Altogether the yields were rather poor, owing to unfavourable weather.

The most important experiments were conducted with cotton. The manurial experiments started thirteen years ago were carried on, and these continued to indicate the great value of general manuring. In order to get further information concerning the flowering and bolling of the plants, an effort was made during the season under review to conduct experiments in a somewhat more detailed form than had hitherto been attempted. The average percentage of bolls to flowers produced was found to be 63. This shows that a great many more flowers are produced than give rise to productive bolls. The report contains instructive diagrams showing the flowering and bolling curves for five of the experimental plots. The two chief causes for the loss of 40 per cent. of the bolls were water shortage and sudden changes in the atmospheric temperature. An attempt is made to show this graphically by putting back the bolling curves fifty days. This period has been found to be the average maturation period of Sea Island cotton. On examination, these curves show that shedding was at its maximum during August and early September. This is not surprising, when it is remembered that during August 67 per cent. of the total flowers were produced, that for the month there was only 3 inches of rain, and that out of thirty-one days there were fifteen on which no rain fell at all. Changes in the temperature of the atmosphere were responsible for shedding of young bolls. Many young bolls were found shed in the plots on mornings after hot days which had been followed by cool nights. As regards seed selection, as in previous years, seed from the individual selected plants Nos. 205, 206, 208, 325, 342 and 416 were planted out in a field from which ratoon canes had been reaped. Figures are given to show that there has been a falling off in the lint length of the selected cottons as compared with previous years, and this appears to be the result of the low rainfall of the season under review, especially at the critical period of the life of the boll. The yield of cotton from these selected plots was good, especially in the case of Nos. 342 and 325, which each gave at the rate of 1,500 lb. of seed cotton per acre.

Concerning progress in the chief industries, the export of sugar from the Presidency during 1917 was 15,048 tons, of which 11,879 were crystals, and 3,169 muscovado. This is 1,058 tons below that of the previous year, and the falling off was due to the dry weather at the latter part of the season, which specially affected the late ratoons. The work with seedling canes has been continued by the department on different estates and special attention is called to the very satisfactory results obtained by private enterprise at Brighton estate. From the sixty selected canes obtained on that estate last year six have again been planted out after careful field selection and juice examination. The cotton industry owing to the war made great advances. The high prices ruling caused a considerable increase in acreage both in St. Kitts and Nevis. The season, on the whole, was favourable. The great portion of the St. Kitts' crop was purchased locally for spot cash by Mr. H. F. Wildy, the agent for the Fine Spinners. On the decision of the Government to purchase all the Sea Island cotton for Admiralty purposes at an advance price of 2*s.* 6*d.* per lb. for clean cotton and 1*s.* for stains, the balance to be paid after the cotton was graded in England, Mr. Wildy handed over the cotton bought by him to the Government. The payment of spot cash again this season by the agent of the Fine Spinners was much appreciated by cotton growers in the Presidency. It is estimated that the average yield per acre of lint was 150 lb. which is low.

An interesting section of the report under review is that by Mr. Kelsick dealing with work in the chemical laboratory. One of the principal matters dealt with was the island's milk supply, over 186 samples obtained by the police having been examined of which thirty-one were returned as adulterated. This is 16·7 per cent. and remains the same as in the previous year. The water added ranged from 6 to 50 per cent. Investigations were continued in regard to the lime requirements of soils and partial sterilization by the application of lime. In the majority of cases the St. Kitts soils show a high requirement for lime. In regard to partial sterilization experiments were conducted with tomatoes and tobacco. The results were interesting and it was found that nearly twice as much weight of tomatoes and nearly twice as much tobacco were obtained from the partially sterilized soil than from the untreated. Another useful line of investigation was the work done on the curing of vanilla beans (*V. planifolia*), vanilla being an important minor crop in Nevis. The process generally followed in curing beans of this variety consists of immersion in hot water, sweating, and drying at moderate temperature. Experiments were made to ascertain various facts concerning this process. In general the experiments showed that treatment in hot water is necessary for the curing of vanilla beans. Successful curing also depends on the temperature of the water in which the beans are immersed before sweating. The optimum temperature for the water would appear to be 80° C. After being dipped in hot water the beans should be thoroughly sweated at 50° C. After sweating the beans should be allowed to dry slowly at room temperature. This takes about two weeks. In curing, the beans lose from 70 to 80 per cent. in weight.

Mr. Howell's report on the experiment station at Nevis shows that the routine work in regard to plant distribution and plot experiments was carried out in a satisfactory manner. A very large quantity of seeds and cuttings was distributed to growers. It is recorded that during the year nearly 210,000 cuttings of sweet potatoes were sent out to growers in the island. There was also distributed over 3,000 lb. of selected cotton seed and 7,700 onion seedlings. In regard to the sugar industry experiments with twenty-four

varieties of sugar-cane were carried out on estates. Cotton seed experiments were continued and also manurial experiments with cotton. Cotton selection experiments were continued and also manurial experiments with cotton. Nitrogenous manuring gave substantial increases in yield. It is reported that the quality of cotton grown in the island during the year under review was very much improved in quality and that there is a demand for only the very best seed for planting purposes.

AGRICULTURAL COSTING.

An important conference has just been held by the British Agricultural Costings Committee, which was recently set up by the Department of Agriculture and the Ministry of Food to obtain permanent information as to the costs and results of farming.

This Costings Committee has already been referred to in the *Agricultural News*, and editorially we have explained costing, and have urged that some attention should be given to costing on estates in the tropics.

Representatives of the chief Associations connected with the Agricultural Industry attended the conference, to discuss with the Costings Committee the most suitable methods of co-operation. Societies representing tenant farmers, small holders, labourers, landowners, land agents, and others sent delegates who expressed the point of view of all the different agricultural interest. It was explained that the Costings Committee was set up as an independent and impartial body, to compile data which could be accepted by the consuming public, and by all the interests concerned in the industry.

After hearing the aims of the Committee outlined to them, the representatives present welcomed the scheme as one which would serve the national interests in a way that has long been needed, as well as being a benefit to the industry generally, and to the individual farmer. In the past few years, especially, the need for an impartial body which could obtain cost records of the various operations on a farm has been increasingly felt, not only from the point of view of those connected with agricultural production, but also by consumers.

It was explained that although the organization to be set up had not yet been decided upon in detail, among other means it was proposed to select groups of typical farms in different districts, and to provide assistance in compiling the records of cost which would be required by the Committee, which also intended to develop the keeping of proper financial accounts by farmers themselves.

The information which it is hoped to collect and analyse should be of practical value to the individual farmer. He will no longer be in ignorance of the actual results of the various departments of his farm; he will be able to see which of his operations are remunerative, and to concentrate on those departments which pay him best; his farming methods and system can be varied, as far as it is practicable and consistent with good husbandry; he can compare his own costs of a particular crop or product with the average cost in the district, and investigate the reason for any abnormal charges in his own case.

In these and other ways the information should promote efficiency and economy, and augment the profit-earning capacity of the farm.

Data will be available which will facilitate the consideration of questions affecting wages. Further, should any question arise affecting the control of prices, etc., proper records of ascertained facts will be in existence. The farmer will have information which will facilitate the adjustment of Income Tax Problems, and the production of proper accounts would in many cases improve credit where financial assistance is sought. There appears to be no question therefore that the industry will be in a stronger position with proper and proved statistics than without those, as hitherto.

Generous offers of assistance from the representatives of the various societies present were made, and the following resolution was passed unanimously:—

> 'That the members of the Conference present fully endorse the value of the work of the Agricultural Costings Committee, and are anxious to render all possible assistance on the lines of the agenda put before them.'

The agenda included suggestions for co-operation in various ways, such as assistance in propaganda work, by circulating notices and memoranda to the members of the various Societies, and by organizing meetings at which addresses on the Committee's work could be given, the provision of information as to farmers who would be willing to place their existing accounts at the disposal of the Committee, or to assist it by keeping accounts in the future, and assistance in classification of farms and collection of data.

A Freak Papaw.—Mr. C. Drieberg, of Ceylon, writes as follows to the *Journal of Heredity*:—'As generally found, the papaw fruit is green in colour when immature, and, though in some cases it continues so, even when fit for eating, it, often shows an orange colouration, running down the fruit in bands. Occasionally the entire fruit turns orange yellow generally when left to ripen on the tree.

'In the village of Dippittigala, about 6 miles from the provincial town of Ratnapura, in Ceylon, the writer observed a clump of papaw trees of a strange appearance. All the fruits, from the smallest to the largest, were of a sulphur yellow colour, and the leaves wore a marble appearance in which the same colour predominated. The smaller fruits were so light in colour that they were almost white. On enquiry, the fact was elicited from one of the prominent residents in the neighbourhood that the seed from ripe fruits of this strange variety gave rise to progeny true to type. Specimens were secured and brought to Peradeniya, where plants raised from seed were found to produce the ordinary green variety.

'Recently the writer visited the same village, and made further enquiries, aud was able to verify the fact that while some of the seed from the trees in question bred true, others did not. The appearance of the trees at Dippittigala suggested the name of 'Albino Papaw'. The question arises—is this a case of Albinism?'

The determination of farming costs is noted in the *Experiment Station Record*, Vol. 40, No. 2. An exact knowledge of cost of production, normal and actual, may prevent farmers from being exploited, either consciously or unconsciously. The knowledge will show whether it is more advisable to combine large holdings, or to split up large farms into small holdings. Knowledge of cost of distribution, as well as the cost of production, may help to solve the problems regarding the elimination of the middleman and the distribution of the divisible surplus of farming between the land owner, the planter, and the labourer.

MARKET REPORTS.

London.—The West India Committee Circular, July 10.

Balata—Venezuelan Block, no quotations ; West Indian Sheet, 4*s.* 2½*d.* to 4*s.* 3*d.*
Beeswax—No quotations.
Cacao—Trinidad, no quotations; Grenada, no quotations.
Copra—£59 10*s.*
Honey—Jamaica, 95*s.* to 99*s.*
Lime Juice—Raw, 2*s.* 7½*d.* to 3*s.* ; Concentrated, no quotations.
Pimento—5½*d.*
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, June 24, 1919.

Bay Oil—13*s.* 6*d.* to 14*s.*
Lime Oil—Cheaper, at 4*s.* to 4*s.* 3*d.* for West Indian distilled, and 11*s.* 6*d.* to 12*s.* for hand-pressed.
Orange Oil—West Indian, 8*s.*

Barbados.—Messrs. T. S. Garraway & Co., July 22.

Arrowroot—$8·60 per 100 lb.
Cacao—$20·00 to $21·00 per 100 lb.
Coco-nuts—$36·00 husked nuts.
Hay—$4·50 to $4·75 per 100 lb.
Onions—No quotations.
Peas, Split—No quotations; Canada, no quotations.
Potatoes—No quotations
Sugar—White Crystals—$8·00.

Trinidad.—Messrs. Gordon, Grant & Co., July 4.

Cacao—Venezuelan, $26·00 ; Trinidad, $24·50.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 20c. per lb..
Copra—$9·00 per 100 lb.
Dhal—$10·50.
Onions—$9·00 to $9·25 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $5·00 per 100 lt.
Rice—Yellow, $12·00; to $13·00 White, $12·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., July 30.

Cacao—Caracas, 26c. to 26½c. ; Grenada, 25¼c. to 25½c.; Trinidad, 26c. to 26¼c.; Jamaica, 21½c.
Coco-nuts—Jamaica selects, $75·00; Trinidad culls, $52·00 per M. $75·00
Coffee—Jamaica, 24½c. to 27½c. per lb.
Ginger—18c. to 21c. per lb.
Goat Skins—Jamaica $1·90; Antigua and Barbados, $1·80; St. Thomas and St. Kitts, $1·80.
Grape Fruit—Jamaica, $6·00 to $7·50.
Limes—$6·00.
Mace—42c. per lb.
Nutmegs—19½c.
Oranges—$4·00 to $5·00.
Pimento—8¾c. per lb.
Sugar—Centrifugals, 96°, 7·28c; Muscovados, 89°, 6·00c. Molasses, 89°. 5·715c. all duty paid.

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CONTENTS.

	PAGE.
Aircraft Services	273
Barbados Crops and Weather	286
Bermuda Grass, Eradication of	279
Board of Agriculture, Trinidad	281
Britain's Falling Exports	280
Coal, Cost and Price of	280
Cotton Notes :—	
Cotton-seed Meal and Potash	278
Cotton Stainer in St. Vincent	278
West Indian Cotton ...	278
Dominica Gardens New Plants at The	283
Dried-Banana Industry, A	276
Fibre, A Durable	287
Gleanings	284
Hill Rice in Antigua ...	277
Hog Cholera Losses Declining	279
Insect Notes :—	
Bean and Pea Weevils (*Concluded.*)	282
Casuarina and Mangrove Both Attacked by the Same Borer...	282
Is Soil Classification Practicable ?...	281
Items of Local Interest	286
Java Sugar Industry Unsettled	
Limes, Green, Wastage of	281
Live Stock in Antigua, Health of	276
Market Reports	288
Milk, Calculation of Added Water in	285
Notes and Comments ...	280
Rainfall, A Matter of ...	287
Rice Situation in Demerara	285
Sisal in Antigua	277
Sugar Outlook for 1920-30	275
Tobacco, Controlled Fermentation of	279
Tobacco, Imperial Preference and	279
Tractor and Plough, 'Twin City	278
Trinidad Credit Societies, Address to	285
Vanilla Curing in St. Kitts	275
Weather and the Moon, The	287

Aircraft Services.

THE members of the British Guiana Colonization Deputation now in London have made a visit to the Handley Page aeroplane works, where they will have had an opportunity of discussing with experts the possibilities of employing aviation for the development of the extensive colony they represent.

In the last issue of this Journal we called attention to the growing importance of the aeroplane for mapping and survey purposes. During the war our airmen succeeded in mapping by photography almost the whole of eastern France. If this can be done under the difficulties and dangers of modern warfare, one would suppose that it would be a comparatively simple, though not necessarily inexpensive matter in times of peace.

The possibilities of aircraft for survey work would be great. Forest land, savannahs, the course of rivers and streams, the position of hills and mountains, could be quickly and accurately delineated. It would be possible for agricultural experts on soil and vegetation, for geologists and surveyors, to travel in machines engaged in this work. They could supplement the maps of the observers with notes of a technical character. In this way the development possibilities of the interior of a country like British Guiana could be quickly studied and the results usefully co-ordinated.

It is interesting to note that in the United States, the aeroplane is being used for the detection of forest fires. Army machines and captive baloons cover portions of the national forests of California, Arizona, and New Mexico. These machines co-operate with the Forest Service principally in the matter of reporting the position of outbreaks by wireless. But experiments are in hand to test the possibility of extinguishing these fires by bombing. The bombs, it is presumed, will contain some substance like liquid carbon dioxide which will have the same effect on fire as the contents of the common house-fire extinguisher.

From press reports in Trinidad and Demerara it is understood that a representative of a London firm of aeroplane makers has arrived in Georgetown to place before the British Guiana Government a concrete scheme for an intercolonial service in the West Indies. The company is stated to be prepared to inaugurate a service without delay provided the Governments will grant them a subsidy. The scheme involves a bi-weekly service between Demerara, Trinidad, Bardados, Grenada, and St. Vincent. It is proposed to use eight-seater machines. The journey between Demerara and Trinidad will take five hours, and the remaining trips one and a half hours each. The machines, which are seaplanes, will carry mails and as much cargo as can be accommodated. The estimated cost of travelling by this service is eight cents per mile. This works out at very little more than the present increased Royal Mail steamer rates.

At the end of the present article some very interesting information is reproduced concerning the cost of machines, their running expenses and upkeep. It will be seen that an important item is overhauling. This necessitates the employment of four skilled mechanics for each machine. No private interprise could stand the expense which this would envolve. There is no reason, however, why a large company with Government subsidies, and plenty of business could not carry on, and it is hoped that circumstances will make an attempt possible in the near future.

An important use of an aircraft service in the West Indies would be the rapid transit afforded to the Government technical officials, particularly those concerned in the outbreak of diseases in plants, animals, and in man. It is not known to what extent this form of transit would be appreciated by those whose studies it would be intended to facilitate; but the fact remains that inter-island visits of inspection, and tours into the interior of the larger colonies would be much quicker, and could be far more frequent.

One thing concerning an air service has to be carefully considered and that is the question of landing. Flying is easy, but landing is difficult. There would be many obstacles to landing in an undeveloped country. This leads one to consider the possibilities of lighter than air machines. The small air-ships, known as 'blimps', used in submarine patrol work, might prove useful. They could travel with safety at very low altitudes. Their speed need be no more than that of a slowly moving motor-car. The observers would then have every opportunity of noting matters of interest connected with the land, and landing itself would not be so difficult as from an aeroplane.

The position then, would seem to be that, for intercolonial passenger and mail transit the seaplane is required. For mapping and surveying we require the aeroplane. For tours of inspection, some form of small air-ship. As matters stand at present it would seem very probable that an aircraft service will eventually become established in British Guiana. The thing most likely to hasten the adoption of such a service would be for the members of the British Guiana Colonization Deputation first to arrange a labour immigration scheme. That would tend to stimulate development and enterprise in every direction.

The following information, taken from a semi-official source, namely the *Colonial Journal*, is that referred to in the preceding article. It will be observed that the cost of overhauling the machines is extraordinarily high:—

Enquiries have been made on behalf of colonial governments with regard to aircraft for local communications Suitable land machines, to carry ten passengers, or one ton of mails, cost from £6,000 to £7,000, with an additional £1,700 to £1,800 for each engine. The life of such machines, if they are well cared for and housed, is about 600 flying hours, and in this period two overhauls would be required, each costing about £550 for the machine only. Each engine also should be overhauled every 150 hours, this costing £300 each time. The life of an engine might be placed as high as 1,200 flying hours. For some services flying-boats would be more suitable, but the cost is greater, being £9,000, exclusive of engines

An aeroplane of the above type would, with the load, have a range of about 500 miles, at a speed of 95 to 100 miles, and would weigh about 5 tons. The petrol required for that flight would be 300 to 350 gallons, and the oil about one quarter of that amount. Each machine requires the full time work of about four skilled mechanics, i.e, two wood workers and two engineers experienced in petrol engines; also some unskilled labour is wanted for handling purposes. The cost of an aerodrome must depend on local conditions; for landing, such machines require an aerodrome of 500 to 800 yards each way, on a flat surface.

It is important that the approaches to the aerodrome should be, as far as possible, free from obstructions, such as trees or tall buildings, for at least a mile. A few buildings or obstacles do not matter, provided there are clear spaces to enable an aeroplane to approach the aerodrome at low altitude. Good approaches would render a relatively small aerodrome suitable.

The aeroplanes of the present day are certainly of sufficient reliability in a commercial sense for short sea journeys and over mountainous country, provided that the engines used are of a well-known type with which considerable experience has been gained.

During a large portion of the life of an aeroplane the running repairs could be carried out by the four men mentioned above, provided that they had had previous aeroplane experience. When an aeroplane needs thorough overhaul, this work is usually carried out in a properly equipped repair shop, for which the ordinary type of skilled mechanic is perfectly suitable, provided that he be given a certain amount of training in a roplane work. Large numbers of engineers are available in England who would be capable of organizing and carrying out such overhaul work.

SUGAR OUTLOOK FOR 1920-1930.

In endeavouring to analyze the sugar situation as it looms up for the coming decade, the Editor of *Sugar* takes the curve of consumption of sugar in the world, up to the time the war started. With the exception of the five-year period 1914 19, this curve showed a steady, and very steep rise during the quarter of a century immediately preceding the war. This steady increase, it is pointed out, was not due, to any great extent, to the natural growth of the population of various countries of the world, but far more to the per capita increase throughout the world.

The total production of sugar in 1913, the year before the war, amounted to 21 million tons in round numbers. During the war, due to many correlated causes the production dropped, reaching its lowest point in the 1918-19 season, when only 16½ million tons were produced. During the coming year, comprising the 1920-21 season, the crop expectations are said to be slightly better than last year, and the actual total production, it is estimated, will probably reach 17 million tons. This is 4 million tons less sugar than was manufactured and consumed in 1913-14.

Many events, it is stated, took place during the period of the world war which have changed the whole attitude of nations, and which will have a lasting influence on their modes of living. Among these is instanced the giving of emergency or fatigue rations containing large amounts of confectionery and sugar, in addition to their customary rice, to hordes of Chinese coolies who were put to work in France; and it is remarked that these people are carrying with them a newly acquired taste for granulated white sugar, a taste which was strange to them before the war. This sudden development of a taste for sugar among Chinese coolies has already had far-reaching consequences—the Japanese have decided to establish a huge beet sugar industry in Northern China and Korea.

On the graphic chart referred to above, the curve stops in the middle of 1919. Tracing the line further, in a manner similar to the rising curve of the previous thirty years, it is found that in twelve years, or in 1932, the world's demand for sugar will reach 36 million tons, or two and a half times as much sugar as the world is producing to-day; and the pertinent question is asked—Where is this great sugar crop to come from? Turning firstly to Cuba, it is estimated that if all its available land is utilized, and its manufacturing and growing improved, Cuba's contribution to the world's demand for sugar by 1932 should be 7 million tons. Then the increase of the beet and other sugar-producing countries is estimated as such as to leave still a deficit of from 3 to 4 million tons, which will have to be filled. America looks to Florida to fill at least a million tons of this demand, and there seems to be no reason in the world, Mr. Keller states, why thirty large centrals should not be in operation at that time (1932). It is also probable that sugar production will greatly increase in South Africa.

Regarding the price of sugar, the writer is of opinion that the average price for the next decade in the United States will probably be in the neighbourhood of 10c. a lb. The fact is recalled that, several months ago, just after the ratification of the prohibition measure by the various States, in a review of the situation in relation to the probable influence of prohibition, a sharp rise throughout the country was predicted. Exception was taken to this in certain supposedly well informed quarters, but as a matter of fact the subsequent heavy demand for sugar came very near creating a sugar famine; and even at the present time the danger is said to have by no means past. Statements coming to *Sugar* from various sections of the country emphasize the fact that in practically every case the demand for additional sugar supplies is far in excess of what had been expected. It might be added that according to the second chart employed in explanation of the article under reference, the shortage caused by the war is computed to be 10 million tons.

VANILLA CURING IN ST. KITTS.

Mr. K. E. Kelsick's experiments to ascertain (1) whether vanilla beans can be cured without immersion in hot water, (2) if not, the optimum temperature of the water in which the beans should be immersed, (3) the best temperature for carrying out sweating, (4) length of time for sweating, were briefly referred to in the review of the St. Kitts-Nevis Agricultural Department Report in the last issue of the *Agricultural News*. The results are of sufficient interest to be given in detail.

These experiments show that treatment in hot water is necessary for the curing of vanilla beans (*V. planifolia*). If hot water is not used the beans turn brown after some time, then black, and finally burst the pleasant odour of cured vanilla being entirely absent. Successful curing also depends on the temperature of the water in which the beans are immersed before sweating. Water at 40° C. seems to have little effect, if any, on the beans which burst, when sweated at room temperature. Somewhat better results are obtained if the beans are sweated at a higher temperature, but they still fail to develop the required aroma. Water at 60° C. also fails to bring about the changes necessary for the development of the odour which is always present in well cured beans. Water at 80°or 90°C. seems to be necessary for good curing. At 80° C. a stronger aroma is developed; this would therefore appear to be the optimum temperature for the water used. Boiling water seems to destroy to some extent the action of the oxidase.

After being dipped in hot water, the beans have to be thoroughly sweated. In this connexion a glass-topped box gave good results. A temperature of 50°C. was obtained in this box. This part of the process seems to be very important. The aroma was not developed in beans which were sweated for a short time in the box. Sweating for a long time at room temperature (30°C.) does not give good results. When sufficiently sweated the beans have a boiled appearance, and have lost from 30 to 40 per cent. in weight. After sweating the beans are allowed to dry slowly at room temperature. This takes about two weeks. Good results are obtained if the beans are wrapped in waxed paper. The beans should be packed in air-tight tins as soon as possible; otherwise much of the aroma is lost, and they become somewhat hard.

In curing, the beans lose from 70 to 80 per cent. in weight.

A DRIED-BANANA INDUSTRY.

The Imperial Department of Agriculture for the West Indies has been in communication with the Colonial Office concerning the possibilities of extending the dried-banana industry in these islands, an industry which so far exists only in Jamaica.

Last December, the Imperial Commissioner of Agriculture requested the Agricultural Superintendent, St. Lucia, to prepare small samples by means of a Chula drier employed there during the war in connexion with the food campaign.

Samples were prepared in due course and forwarded to Barbados, but they turned out to be valueless on account of the excessive drying to which they had been subjected.

Further trials were made in due course. Ripe bananas were simply peeled, not sliced, and gently heated at a temperature of about 150° F. for sixty-four hours, until they reached a firm consistency, care being taken to provide ventilation, which is very essential. Another sample was dried in the sun.

Both these samples have been pronounced to be palatable articles of diet in Barbados, and larger quantities forwarded to the Imperial Institute, London, for commercial valuation, have been reported on favourably too. This report is published as the conclusion to this article.

As regards the cost of producing dried bananas in St. Lucia, Mr. A. J. Brooks, the Agricultural Superintendent, has furnished the following information. In the second trial referred to above, 30lb. of ripe bananas were used. The skins when removed, weighed 7½ lb., thus leaving 22½ lb. of fresh banana. The dried bananas weighed 6½ lb. On this occasion the bananas were purchased at 1*d.* per lb. The original cost was therefore 2*s.* 6*d.* If the dried product of this trial sold at 6*d* per lb. on the spot, without further charges of packing, freight, etc., it would, in Mr. Brooks's opinion, just about pay. The dried product at 6*d.* per lb. would realize 3*s.* 1½*d.*, leaving a difference of 5½*d.* per lb., which sum would have to cover labour in handling, loss from decay, and cost of fuel. If large quantities were handled, the cost of drying and handling would be greatly reduced. In this connexion the report of the valuers in London that the sun-dried fruit are better than the artificially-dried is important.

There is little doubt that with a good supply of sound fruit at about 1*d.* per lb., and the sun-dried products disposed of at 6*d.* per lb, a profitable industry could be established in the West Indian islands.

The following is the report on the samples from St. Lucia, received from the Imperial Institute:—

'DESCRIPTION OF SAMPLES. The samples consisted respectively of sun-dried and artificially-dried bananas

'The sun-dried bananas were in excellent condition, pale in colour, and of good appearance, except that the netting used as a support during drying had produced deep markings in the fruits.

'The bananas which had been artificially dried in a drying apparatus were distinctly inferior to the sun-dried sample. The fruits were very dark in colour on the side which had been in contact with the netting used as a support, and this defect would detract from their value.

'COMMERCIAL VALUATION. The samples were submitted for valuation to fruit merchants in London, who considered the sun-dried bananas to be of good quality and worth 6*d.* per lb. wholesale in the United Kingdom (July 1919)

'The flavour and quality of the machine dried bananas were pronounced to be quite satisfactory, but such dark-coloured fruits would probably not be saleable when lighter fruits like the sun-dried sample are available. If, however, the darkening in colour could be avoided, they would be as valuable as the sun-dried bananas.

'These dried bananas from St. Lucia are somewhat larger than those now selling in the United Kingdom. The latter fruits are of about the same colour as the sun-dried sample, and realize 6*d.* or 7*d.* per lb. wholesale, whilst some lighter-coloured fruit have recently been imported and are being sold at prices ranging up to 10*d.* per lb.

'Before the war dried bananas sold at 3½*d.* per lb. wholesale in the United Kingdom, but during the war the price reached 2*s.* 6*d.* per lb. The importation has rapidly increased, but the future demand and price will depend upon the price of fresh bananas, which at present is high When abundant supplies of cheap fresh bananas again become available the demand for the dried fruit will fall, but there will always be a certain outlet for them as the trade has now become established.

'REMARKS. These sun-dried bananas from St. Lucia are of good quality, and consignments of similar character would be saleable in the United Kingdom. The artificially-dried fruits were inferior to the sun-dried on account of their dark colour, and it would be desirable to carry out experiments with a view to obviating this defect. The lighter the colour of the fruits, the higher will be their market value in the United Kingdom.

'It is not advisable to pack bananas in ordinary paper as it adheres to the fruits, and 'biscuit' paper or some form of grease-proof paper would be more suitable. It may be mentioned, however, that dried bananas usually arrive on the United Kingdom market in wooden cases, each containing ½-cwt. of bananas packed in layers without any wrapping material.

'The fruit merchants who valued the samples stated that they would be willing to receive a trial shipment of about ten ½-cwt. cases of dried bananas from St. Lucia, provided that the quality was not below that of the present sun-dried sample. Information should therefore be furnished to the Imperial Institute as to the possibility of forwarding this quantity for sale.'

Steps are being taken to supply the valuers in London with the larger quantities asked for.

THE HEALTH OF LIVE STOCK IN ANTIGUA.

The report of Mr. H. Goodwin, M.R.C.V.S., Inspector of Animals in Antigua, which has been received from the acting Colonial Secretary, contains various items of information which show that the position as regards the health of live stock in Antigua is still far from satisfactory.

At the beginning of the report Mr. Goodwin says that a number of estates still depend upon ponds and pools for their water-supply; the collecting areas of many of these are infested with parasites, and the animals going to drink become infected at the margins of the ponds. There are other pools and ponds which are close to pens, and in heavy weather, they receive the drainage contaminated with the manure. It is not difficult to understand, therefore, that under these conditions, tuberculosis and other diseases exist. As to the principal ailments which occurred during 1918-19, the report refers principally to those affecting horses. Such cases as occurred of epizootic lymphangitis showed signs of spontaneous recovery. It is believed that the incidence of this

disease is influenced by certain conditions of climate, the hotter and more humid the atmosphere, the greater the prevalence and effect.

The soil of Antigua is stated to be impregnated with the germs of tetanus, and cases are always appearing; but most surgical cases are now rendered immune by the use of anti-tetanus serum. The cause of a considerable variety of internal trouble in horses are parasites of a vermecious character, principally the so-called long worms. Ticks also continue to reduce the efficiency of live stock, particularly cattle. Mr. Goodwin states that the people have become intelligently acquainted with the use of Cooper's Dip, but owing to a shortage of supply in the island, many had to do without, and a large number of animals suffered in consequence. Skin disease (Leudodermititis) is now rarely met with. On neglected lands which show all kinds of rank herbage, sporadic cases occur.

Concerning tuberculosis the report appears to be fairly satisfactory. Of nearly 600 cattle killed during the year at the Public Market, only eighteen showed signs of it; and of nearly 800 pigs only one was affected. It does not follow from this, however, that the Antigua herds are by any means free from tuberculosis in its passive form. Nothing is said in the report about the health of milch cows, a matter of considerable importance from a public health point of view.

Amongst pigs, the chief trouble experienced appears to have been in connexion with parasites of the liver and intestines. No cases of hog cholera were met with. Mr. Goodwin is of opinion that the island is now free of it.

Discussing the live stock situation from a general standpoint, the report says that the greatly increased attention given to cotton and sugar-cane on account of high prices has caused a general neglect of the animals. Another and more serious circumstance is the increasing prevalence of theft. This has become so serious that many good stock owners are selling their animals and turning attention to the growing of crops.

In regard to mules, the report observes that during the past two years mules have been imported at the cost of nearly £5,000. With two very good jacks in Antigua and one in Barbuda, it would seem much more economical to import two or three good class mares of the Suffolk breed type, so that mules of the shaft type needed by estates could be bred locally.

HILL RICE IN ANTIGUA.

During the year under report, seeds of Hill or Upland rice were imported from Trinidad for experimental trials in Antigua.

A $\frac{1}{10}$-acre plot of this rice was planted on February 10. On the whole, the germination was good, and the plants flowered early in May. The plot was reaped on July 9, and 41 lb. of paddy were obtained. This yield was disappointing, as the general appearance of the plants indicated that good returns might be expected. It was found, however, that a number of the flowering panicles did not bear seeds, and in addition, small birds devoured a fair proportion of the seed. Further attempts to grow this rice will be made.

As seeds were given to planters and peasants for trial, it may be interesting to quote the method adopted in Trinidad by the small grower for husking rice. The paddy is soaked for about twelve hours and then boiled until the grain swells and bursts the husk, usually one and a half hours. The rice is then thoroughly dried, and pounded in a motar and winnowed. (Report on the Agricultural Department, Antigua, 1917-18.)

SISAL IN ANTIGUA.

The extension of the sisal plantation which is being undertaken in the windward district of Antigua has been somewhat retarded in the past on account of the limited amount of planting material which could be supplied locally, and the difficulty experienced on account of limited shipping facilities in obtaining plants from Anguilla. The plants which were established in the district in question some three years ago are now suckering freely, and in a short time there will be sufficient to meet all requirements, which will probably result in the area under this crop being rapidly increased.

The appearance of the young sisal plantation is, on the whole, promising. The plants have made fairly good growth and are in a healthy condition.

In the Report of the Agricultural Department, Antigua, for the year 1915-16, some notes were made in connexion with cultivation of sisal. In this publication the question of sisal propagation, the rate of growth, etc., are discussed. As this is a new industry, these remarks may be added to, as they possibly will be of interest to local planters.

It has been stated that sisal will grow and thrive on land without any cultivation or weeding. This statement may be true for certain types of land, but in Antigua, periodical weedings must be resorted to, or normal growth cannot be expected. It is probable that sheep or other small stock would help to keep down weeds, during early stages, and in addition, apart from lessening the cost of the maintenance of the plantation, the venture in itself would possibly be a paying one. Every effort should be made to keep the plants in a healthy condition, for it should be remembered that large leaves are desirable, as the value of fibre increaes according to its length, and it is important that leaves of not less than 2 feet 6 inches to 3 feet be obtained. A special knife is used for cutting the leaves, and after what has been said in the previous paragraph, it will be seen how necessary it is that they are cut as close to the trunk as possible. After cutting, the side prickles, if any, are rubbed off by the harvester, and in addition, the end spike is removed. The leaves are then made into bundles (butt and point alternating) of 50 or 100. In Antigua it is possible that the smaller sized bundle would be adopted as it is easier to handle. It should be remembered that cutting lengthens the life of the plant.

The crop is an extensively bulky one, and it is possible that it would pay to use movable tramlines for carting the crop from the field to the decorticating plant.

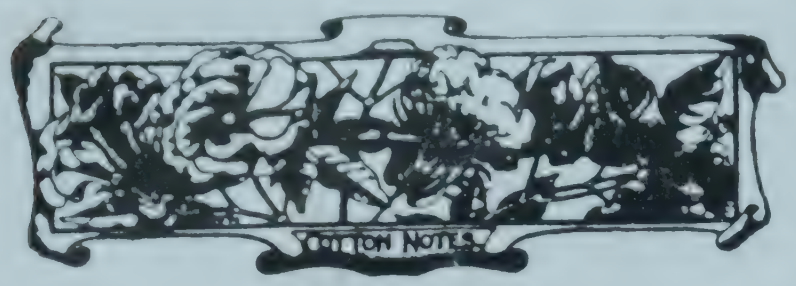
It is not proposed to mention any types of machines, but excellent ones are now on the market at moderate prices.

After cleaning, the fibre is dried on racks, and then made into bales from 350 to 500 lb.

In connexion with this crop, it should be noticed that it is profitable to grow large areas of it, as an up-to-date machine is capable of handling large quantities of leaves.

(Report on the Agricultural Department, Antigua, 1917-18.)

Mr. A. E. Collens, the Acting Government Chemist and Superintendent of Agriculture for the Leeward Islands, has informed this Department, that under the (Antigua) Cotton (Close Season) Ordinance, 1919, a Proclamation has been issued declaring that no cotton shall be sown or planted in that area of the Presidency commonly known as the Five Islands District, from July 28 to August 10, 1919, inclusive.



COTTON.

WEST INDIAN COTTON.

The following information concerning the cotton market in Liverpool is contained in a circular dated July 31, 1919, issued by the British Cotton Growing Association :—

In connexion with our last circular, we have been endeavouring to find out present prices of West Indian Sea Island cotton in Liverpool. The position is exceedingly difficult in view of the fact that there is no cotton on the market. We think it possible, however, to give an approximate valuation of West Indian cotton, and, basing it on what is doing in American Island, we should think that your cotton should be worth 45*d.* to 48*d.* per lb., according to quality, if on the spot in Liverpool.

This price is probably what you would get if the cotton were here, owing to the demands from outsiders and the exhaustion of the Carolina stocks. It must not be overlooked, however, that the new crop Carolina should be in Liverpool in October, and if there was a big weight of West Indian on the market about the same time, the situation might be altered ; but if your cotton were to arrive here shortly it would, if the quality was good, command the best prices.

Cotton Stainer in St. Vincent.—Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, has issued the following circular in that island : 'Cotton stainers can exist for several weeks in the adult stage without breeding, and in the absence of their regular food-plants. Some insects may have survived this season in the vicinity of buildings used for storing seed-cotton, cotton seed, and cotton seed meal, and others on trees and bushes in sheltered places. It is these relatively few survivors which may form the nuclei of infestations of cotton fields. Observations have been made in regard to the habits of these adult stainers in the close season, and it is found that they make their way to the cotton fields just about the time the young plant starts to flower, which is approximately two months from the time of sowing the seed. It is possible for planters to collect the insects at this time, and with care, the fields can be kept free of the pest for several months. All that is usually necessary is to have the plants in the first planted field or fields thoroughly searched for a few days about the time indicated, and any insects found destroyed.

'At times, also, cotton stainers are attracted to fields where cotton seed meal is being applied as a manure. Here again it is important that a look-out should be kept for the insects, and any seen collected and killed.

'At the Experiment Station the collection of the adult cotton stainers as they appeared in the month of July each season on flowering cotton has resulted in the plots being freed of the pest until the end of the month of January following.'

Cotton-Seed Meal and Potash.—Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, has issued the following circular : 'Cotton-seed meal is primarily a nitrogenous manure. It contains a relatively small quantity of potash—a plant food so necessary for the successful bearing of cotton and other plants. Where ashes are available, planters supplement the potash contained in the meal by the addition of these from sugar works, wood and bush. This is an excellent practice and should be carried out whenever possible. The object of this circular, however, is to issue a note of warning against mixing ashes with cotton-seed meal and storing the mixture. The reason why this should not be done is this. Ashes contain a large percentage of lime, and lime, although a plant food, possesses the important property of expelling or setting free nitrogen in the form of ammonia, when mixed with nitrogenous manures. If, therefore, ashes are added to the meal and not applied for some time, there is a danger that much of the valuable nitrogen will be lost. A good plan is to defer the mixing until the manure is required, and then only to prepare such a quantity as can be applied the same day.'

The 'Twin City' Tractor and Plough.—The following announcement appeared in a recent issue of the Barbados *Standard* : 'In another part of this impression there will be found a notice by Mr. J. F. Hutson, of this city, the local representative of the Automotive Products Corporation, relating to the expected arrival of a 'Twin City,' Tractor and Plough per SS. 'Korona' on the 26th instant, accompanied by a factory man. The tractor and plough is a modern agricultural implement designed for the special purpose of affording an efficient mechanical substitute for animal power in the tillage of the soil, and on its arrival a practical demonstration of its utility will be given by Mr. Hutson at a time and place to be announced later. The attention of all persons interested in the matter is specially directed to this advertisement.'

In the usual gas or oil engine much of the heat generated by the combustion of the fuel is wasted. It passes away with the exhaust gases and into the water used for cooling the cylinders. A new form of engine has been described before the Royal Society of Arts. According to the *West India Committee Circular*, July 24, it represents a combination of internal combustion engine and steam engine. The waste heat is employed to generate steam The piston driven in one direction by gas or oil is propelled on its return stroke by steam. It is claimed that this engine shows a fuel efficiency at least 20 per cent. higher than that reached in other types of prime mover.

Nematodes seem to be of growing importance in agricultural pathology. A new worm has just been discovered in India causing parasitic gastritis in calves. The parasite is of interest because it is not identical with any species previously recorded and, further, it does not fall into any of the established genera. This is of note in connexion with the new nematode discovered as the cause of red ring disease of coco-nuts in the West Indies. The parasite first referred to is fully described and figured in *Bulletin No. 86*, Agricultural Research Institute, Pusa India.

HOG CHOLERA LOSSES DECLINING.

Since 1913, when the United States Department of Agriculture began work to control hog cholera, the dreaded disease has become less and less destructive each year. A force averaging 165 federal veterinarians has been maintained working in co-operation with State authorities in charge of quarantine and other regulatory measures necessary for the success of control work. During the fiscal year 1918, more than 5,500,000 hogs were inoculated with anti-hog cholera serum, and more than 2,200 farms, found to be infected with cholera, were cleaned and disinfected under supervision of the department verterinarians.

Altogether representatives of the department visited more than 1,500 farms to investigate reported out-breaks, to apply preventive measures, and to clean and disinfect premises. How great a menace hog cholera has been to the nation's swine industry may be judged from the accepted estimate that 90 per cent. of hogs lost from all ailments die from cholera. In 1918 the death rate of swine from disease was placed at 42·1 per thousand. Thus the loss was slightly above 4 per cent. for the United States, the lowest on record, according to the department's figures. (From the *California Cultivator.*)

CONTROLLED FERMENTATION OF TOBACCO.

One of the principal difficulties of tobacco production is not in the growing, nor in the curing, but in the fermenting. This was found to be the case in St. Kitts and in other small West Indian islands which at one time endeavoured to establish a tobacco-growing industry. Perhaps the following information, taken from the *International Review of the Science and Practice of Agriculture*, may lead to the establishment of co-operative tobacco fermentation factories in places where the cultivation of the crop could be carried on by small growers:—

The series of tobacco fermentation experiments carried out for several years by the Vorstenlanden Tobacco Experiment Station (Dutch East Indies) has led to the construction of a building where the mounds of tobacco can undergo continuous fermentation without handling.

Satisfactory results were obtained. The tobacco fermented is of very good quality. The building is composed of three rooms 4 metres wide, 4·75 metres long and 3·50 metres high internal measurements. The double walls are hollow, but closed here and there by brickwork which supports the walls. The middle walls, which are very thick, isolate the rooms sufficiently from one another. Lighting is obtained through three small windows 25 × 50 cm.

As the temperature is lower near the windows, it is taken in the centre of the room by means of electric thermometers. The rooms are closed by double doors, the outer one of wood, the inner one of eternite. The rooms are roofed by slabs of eternite, above which there is an insulating layer of rice husks covered by planks; the ceiling is supported by wooden supports.

Gas pipes, 5 cm. in diameter, are used for heating. In each room there are rings of tubes running along the walls provided with a tap for regulating the temperature and arranged in such a way that their lower end is near the wall of the machinery room. At that point there are also drainage pipes provided with taps, so that the water of condensation can be drained away to the outside. In fact, the water must be drawn off regularly or the pipes will not heat. Tubes, 25 cm. in diameter, connect the heating pipes to the boiler. The steam is produced by a locomotive boiler placed outside, together with the engine that drives the suction pump.

The pressure is generally maintained at two atmospheres; it is rare that a heavier pressure is required to maintain the desired temperature.

In order to maintain a suitable degree of humidity in the rooms, a ring of 25 mm. pipes, perforated with holes about 1 mm. in diameter, is placed on the floor ; the ring is connected to the steam supply. This simple device enables the degree of humidity to be regulated exactly, while it is controlled by means of two electric thermometers acting as hygrometers. The floor is slightly sloping, so that the water of condensation can flow away.

The tobacco is heaped upon the flooring, which is raised to prevent it decaying and to allow the steam to escape through the holes in the ring (described above), placed just below the centre of the heap. A long iron pipe, open above and perforated along its length, is introduced vertically into the heap. The air passes along this tube into the centre of the heap. The air is led from the vertical tube to the perforated rings used to ventilate the outer part of the heap. As the heap subsides here and there as it ferments, the rings move in a vertical direction and should, of course, be joined to the central tube in such a way that they can move.

Ordinary rubber tubes should be used to join the central pipe and the rings, rather than the flexible metal tube used in previous experiments.

Imperial Preference and Tobacco.— There is a splendid opportunity, says the *Rhodesia Agricultural Journal* for June 1919, for taking advantage of the recent Imperial Preference to establish Rhodesian tobacco on the British market, for the preference given will amount to opproximately 1*s.* 4*d.* per lb. on the present tariff. This gives Rhodesia considerable advantage over American imports, and in view of the fact that tobacco comparing very favourably with Virginia leaf can be grown in Rhodesia, it is only reasosable to suppose that the manufacturers in the United Kingdom will be very ready to take all the leaf of a suitable quality that Rhodesia can send. It is not expected that there will be any leaf available for export this year, but the preference mentioned will undoubtedly lead to considerably larger acreage being placed under tobacco next seaon, and consequently a certain proportion of the crop will be available for export.

Eradication of Bermuda Grass.—Bermuda grass is the common lawn and pasture grass of the West Indies, and is known botanically as *Cynodon dactylon.* It is one of the most valuable grasses in the tropics and subtropics, but in the Southern States it is at the same time a most pernicious weed. In the West Indies it also gives trouble as a weed, but it may be said generally that its valuable qualities are much greater than its bad. Bermuda grass has two natural weaknesses : first, it is unable to withstand shade, and secondly, the root stock is very susceptible to winter killing. These two weaknesses are utilized for purposes of control in the Southern States. Summer shade crops, like velvet beans, are alternated with intertilled crops, such as corn and cotton; the soil being occupied with oats or rye during the winter. Hogs are also useful in eradicating Bermuda grass. They are fond of the root stocks.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with the various ways in which aircraft may prove of service to West Indian agriculture in the near future.

On page 276 will be found an important article on the dried-banana industry which is likely to expand in these islands. A note on the health of live stock in Antigua appears on the same page.

Information of special interest regarding the recent weather will be found on pages 286 and 287.

Insect Notes, on page 282, comprise the conclusion of an article on bean and pea weevils, together with a note on Casuarina and mangrove attacked by a destructive borer.

Britain's Falling Exports.

A specific instance of the rapid decrease in Great Britain's export trade is afforded by facts and figures relating to rubber goods. At the end of 1915 the value of motor tyres and tubes exported from the United Kingdom and the United States was about equal, but at the end of 1916 the value of the American exports was 21 million dollars, whilst that of the British exports was only 10 million dollars. At the end of 1918 the British exports were some 6 million dollars below the American, while the former showed a downward tendency and the American export values an upward tendency.

The *India Rubber World* (for July 1) in commenting on these figures very justly remarks that this was largely due to Great Britain cutting down her exports in order to win the war. There is very little to be said, however, for the present decline in British exports. If with her enormous interests in rubber production out East, her reputation for good grade manufactured articles, and her favourable position geographically for shipment—if, with these assets, she cannot make headway with rubber, then there is little hope for progress in other industries, with labour and capital so opposed as they are at present.

Cost and Price of Coal.

The increase in the price of British coal will affect trade all over the world, and will be felt in the West Indies in the form of persistently high passenger and freight rates by British steamers. It will furthermore increase the price of British made goods, and deflect West Indian trade still more, if that is possible, to the United States and Canada.

In England, the average pit price of coal per ton raised in 1913 at the pit's head was 10*s.* 1½*d.*, and the same figure to-day is 26*s.* 0½*d.* For tons sold, the corresponding figures are 11*s.* and 29*s.* 3½*d.* The selling price to-day would be several shillings higher if it were not that the Government is subsidising delivery by holding down the railway freights.

In making these statements (reported in the London *Board of Trade Journal* for July 17) Sir Auckland Geddes refers to the present position as 'one of great gravity and seriousness'. The position is made very much worse by a great reduction in the number of tons produced.

The effect of the increased price on the steel industries is shown by the following figures: Rails in Great Britain before the rise in the price of coal cost £16 a ton; after the rise £17 10*s.* a ton; and in the United States to-day £10 a ton. Ship plates, £17 15*s.* a ton before the rise; £19 5*s.* probable new price; American price £11 15*s.* The key to the position rests with the British miners, on their increasing the output of coal.

At the present time, September 3, the position in regard to coal output and the work of the miners appears to be more settled, and most of the strikers have returned to work. It will, however, be some time before anything like the old standard of production is reached.

Is Soil Classification Practicable?

Mr. R. L. Pendleton, of the University of California, has investigated the question as to whether the soils mapped under a given type-name by the United States Bureau of Soils method are closely similar to one another. He comes to the conclusion that they are not, and this conclusion is shared by D. C. B. Lipman, the well-known soil bacteriologist of the same University.

These opinions are important. It would appear that in this soil classification we have still another instance of the dangers of generalizing in agriculture.

The methods and results adopted in the studies of the classification system are described in detail in the University of California Publications in *Agricultural Science*, Vol. III, No. 12, pp. 369-498. Presumably typical samples of four soil types were collected for laboratory and green house study from widely distributed localities in the State of California. The field appearance of each sample was usually sufficient to warrant the classification that exists. Physical, chemical and bacteriological studies, however, showed that soils of one type are not similar, nor were different representatives of a given type the same in their ability to produce crops.

Java Sugar Industry Unsettled.

The total production of sugar in Java during the last three years was: 1916, 1,620,000 tons; 1917, 1,839,300 tons; 1918, 1,799,500 tons.

A very considerable reduction in the quantity of cane produced was compensated by a much higher percentage of sugar obtained, so that the net result of the 1918 crop has been only slightly less than the record crop of the previous year.

As regards prices the year 1918 was one of great fluctuations. In consequence a Sugar Association was formed with the object of selling at the best possible prices all the sugars controlled.

According to a report in *The Board of Trade Journal* (London) for July 24, the prospects for the 1919 crop were poor. The existing difficulties and uncertainty in sugar circles led most producers to reduce their area under cultivation by some 15 per cent., and the exceptional drought from May to November 1918 had a very serious effect on the growth of the cane, so that total production this year is not expected to have exceeded 1,200,000 tons.

The uncertainty in sugar circles and the reduction in area under cultivation are somewhat remarkable.

The figures showing the destination of Java sugar are interesting, especially in regard to the United Kingdom and Japan. In 1916, the United Kingdom imported 537,819 tons and Japan 49,905 tons; in 1918, the United Kingdom imported 67,307 tons, and Japan 328,745 tons.

This was largely due to the enterprise of the Japanese shipping trade at the time when Dutch shipping was requisitioned.

Board of Agriculture, Trinidad

At a meeting of the Trinidad Board of Agriculture on August 21, the proceedings of which are published in the *Port-of-Spain Gazette*, Mr. W. G. Freeman, B.Sc., Acting Director of Agriculture, made some interesting statements concerning the work of the Department of Agriculture, and the general position as regards the cultivated crops in the Colony. The experimental plots of the Department are on River Estate, and it has been declared in the Trinidad press that the results are of very little value to the small cultivator. The nature of the work done there, as described by Mr. Freeman, shows that this is not the case. The principal lines of work at River Estate at present, in regard to cacao, consist of (1) planting distance experiments, (2) cultivation experiments, (3) shade and no shade experiments, (4) manurial experiments, (5) individual yield of trees, (6) value of seed selection, (7) budded cacao experiments, (8) replacement of poor bearers. All this work is of equal interest and importance to the small and large cultivator. In addition to the above, the prize competitions for cacao and tobacco growing are conducted entirely for the benefit of the small grower.

Concerning the general position as regards the Colony's crops, Mr. Freeman pointed out that cacao was comparatively free from disease compared with the state of that crop in many other countries, especially Ecuador. Moreover, the production of cacao, coco-nuts and sugar had increased rapidly during recent years, and the general outlook for the future was in most respects very satisfactory.

Wastage of Green Limes.

With reference to an article on the wastage of green limes, published in the *Agricultural News* for May 3, 1919, Mr. J. Jones, Agricultural Superintendent, Dominica, writes to say, says the *Dominica Chronicle*, that the question of whether the fruit should or should not be cured or 'quailed' in the West Indies is one which requires special local investigation. Although such curing is condemned by the United States authorities, it is possible that citrus fruit in the United States is cured to some extent on the trees during hot autumns before they are harvested. The fruit is gathered and packed in the fields, placed in railway cars in chilled air compartments, and at once sent to market. This, however, does not help the West Indian grower of citrus fruit, who has his special difficulties to face. For instance, in Dominica, preparations for shipping limes have to be made ten or twelve days before the steamer arrives. Packing is usually done two or three days before shipping, and therefore some of the fruit is bound to be somewhat cured, while the portion received in the last couple of days is packed fresh.

It is hoped, continues the *Chronicle*, that investigations into what happens with regard to the different grades of fruit when received in New York may be undertaken by the Agricultural Department, in the interests of the trade in green limes from Dominica.

INSECT NOTES.

BEAN AND PEA WEEVILS.

(*Concluded.*)

The measures to be adopted to prevent injury consist of planting only sound seed, thorough cleaning up at the end of the crop, and treatment of peas and beans for the purpose of killing the insects in them to prevent continued destruction in storage.

Infested seed used for planting is likely to be the means of introducing the weevils into the field. Badly infested seed will either fail to germinate, or will produce plants that are weak and incapable of making good growth because of the loss of stored-up food material which has been eaten by the weevil grubs. Seed intended for planting may be dropped into water, and the sound seed will sink while that which is much infested will float.

When the crop is harvested great care should be exercised to collect all pods and seeds so that none shall be left on the ground to furnish breeding places for the insects, to enable them to tide over successfully the interval between crops. As soon as the crop is ripe the grain should be harvested and the seeds shelled out of the pods, subjected to treatment which will kill the insects contained in them, and put up for storage in such a manner as to prevent reinfestation.

It must be remembered that even though all the insects in such peas and beans may be killed, these seeds are liable to reinfestation unless properly protected against it. Weevils in peas and beans may be killed by application of heat, fumigation with carbon bisulphide, or with carbon tetrachloride.

Carbon bisulphide and carbon tetrachloride are similar in all essential features, except that while carbon bisulphide is highly inflammable, carbon tetrachloride is non-inflammable.

In fumigating with carbon bisulphide, seeds must be placed in air-tight containers. Small quantities may be treated in a kerosene tin or similar receptable, and for larger quantities, barrels, puncheons or hogsheads may be used. If the seeds are thoroughly dried they may be stored in the same containers, where they may be examined from time to time, and fumigated again if it is found necessary. Carbon bisulphide is used at the rate of 3 lb. per 1,000 cubic feet of space to be fumigated, in a thoroughly tight receptacle. If the receptacle is not tight the fumigation will give unsatisfactory results even if the dose of carbon bisulphide is increased. The carbon bisulphide is poured on to the top of the seed and the receptacle covered with a tight cover. The liquid quickly vaporizes, and as the fumes are heavier than air they settle into the mass of seed, penetrating to every part and even into the interior of injured seeds. Fumigation should continue for from twenty-four to forty-eight hours. Peas and beans are not injured either for planting or for eating by this fumigation. The disagreeable odour of the carbon bisulphide passes away when the seeds are thoroughly aired.

The application of heat affords a useful and convenient means of killing weevils in stored grains. Weevils in peas and beans are killed by a temperature of 130° F. to 140° F. for a few minutes. In dealing with a small quantity of seeds they may be spread out in a thin layer and placed in an oven. In the case of large quantities, as would be the case if the entire product of a considerable acreage were to be treated, a drying machine such as those operated by the Government in St. Vincent and Antigua would be useful. In such case a temperature of 140°F. for five to ten minutes would be probably sufficient, since these machines are so constructed as to allow all the seeds to become thoroughly heated, and for equal lengths of time.

In the Southern States certain farmers have mixed cowpeas which were being kept for planting with dry road dust or dry air-slaked lime. These substitutes do not appear to kill the weevil in the seed, but they either prevent them from emerging, or if they do emerge, from the laying of eggs, and thus the continued attacks are stopped.

NAPHTHALENE-STORING IN SACKS, ETC. Naphthalene is useful in connexion with the protection of peas and beans and other seeds and grains from insect attack in storage. Used in large quantity it acts as an insecticide and will kill the insects in the seeds, and it also acts as a repellant and prevents reinfestation. For the protection of stored seeds 1lb. of naphthalene is said to afford protection for 40 bushels of seed. The naphthalene is put up in cloth bags each containing $\frac{1}{4}$-lb. distributed in the mass of the grain. The naphthalene being in bags, makes it possible to recover any that has not evaporated, and considerable saving is thus effected. Fairly tight receptacles are necessary for the use of naphthalene to give best results.

While there is no doubt that the weevils which attack peas and beans cause serious losses, yet it is certain that much may be done to reduce the amount of these losses. A further development of kiln drying as a means of conditioning grains and seeds of all kinds in these islands should give a sense of security to growers who wish to increase the amounts of leguminous and other food grain, since it should allow for the treatment of seed before storage, while proper storage combined with this should reduce the losses from weevils very considerably.

CASUARINA AND MANGROVE BOTH ATTACKED BY THE SAME BORER.

According to an article in the *Journal of Economic Research*, Washington, D.C., Vol. XVI No. 6, the casuarina which has been extensively planted in Florida has been seriously attacked by the mangrove borer (*Chrysobothris tranquebarica*, Gmelin). Casuarina is a tree of much value for planting in the West Indies, and deserves to be more used than it has been in the past; the mangrove and its borer occur in some of these West Indian islands. On this account the article mentioned is summarized herewith for the benefit of readers of the *Agricultural News*.

The red mangrove (*Rhizophora mangle*, L.) is a native of the West Indies and perhaps also of Florida. The mangrove borer, also a native of the West Indies, is recorded as

occurring in Cuba, Porto Rico, and Guadeloupe. It was known to science as long ago as 1787, but it appears that nothing was known previously with regard to its various stages, seasonal history, habits, etc. It has been known in Florida since 1886, but it is only within the past three or four years that it has been recognized as a pest of casuarina.

The adult beetle is a small insect of a metallic greenish-bronze, colour. The female measures from 13·5 to 17 mm., and the male 12·5 to 14 mm. in length. Both sexes are fond of bright sunlight and are commonly found flying from 10 a.m. to 3 p.m. They feed on the tender, succulent bark of trees they infest.

The eggs are inserted under the thin outer layer of dry bark of the mangrove. When the eggs hatch the larvae bore into the soft bark to the wood where they remain feeding on the cambium until nearly full-grown ; at this stage the larva bores into the wood and excavates the pupal cell and provides a tunnel by means of which the adult insect will make its way to the outer world as a beetle.

One year is required for the development of the mangrove borer from egg to adult. So far as is known, this insect attacks only living red mangrove and the casuarinas. It is not a borer in dead wood.

In Florida both these trees have been killed by this borer, and the killing out of the tops or the main stem and forcing growth into the branches producing a stag-head effect appears to be a characteristic form of injury.

The pest may be controlled in casuarina by scraping the bark and digging out the grubs, and by spraying the stems with a poisoned oil emulsion, made according to the following formula :—

Standard miscible oil	1 pint
Water	5 gallons
Sodium arsenate	¼ lb.

Dissolve the arsenate in water, stir, then add 1 pint of miscible oil. Casuarina trees in infested localities should not be pruned from April to August, as the flow of sap will attract the flying beetles to the trees.

NEW PLANTS AT THE DOMINICA GARDENS.

The following notes appear in Mr. Joseph Jones's Annual Report on the Dominica Agricultural Department for 1918-19, which is just being issued.

The Mexican apple (*Casimiroa edulis*), introduced seven years ago, fruited early in 1919. This species does not do well in the Gardens, but it grows with considerable vigour in the stiff soil at Morne Bruce. The two specimens were blown over in 1916, though not uprooted. Vigorous sucker growth followed, and fruit was produced as stated. Owing to the exceptional drought experienced at this time, only a few fruits matured. These were found to possess an agreeable taste. The seeds are said to be poisonous.

A couple of plants of the Rambutam (*Nephelium lappaceum*) were raised from seed received from the Botanic Gardens, Buitenzorg, Java, one of which is growing vigorously. Seeds of *Nephelium mutabile*, received from the same place, failed to germinate.

The Gardens now possess four healthy young trees of *Foutaria suavis* native to Uruguay, which is said to yield an agreeable fruit. Several plants have been distributed to planters for trial.

The two specimens of the Jaboticaba (*Myrciaria cauliflora*), a fruit tree of Brazil, are not so promising as when in their early stages. It would appear that the climate of this island is not altogether suitable for them.

All attempts to establish the Brazil nut (*Bertholetia excelsa*), which have extended over a number of years and under varying conditions, have resulted in failure. A few plants of *Lecythis Zabucajo*, the Sapucaia nut, grown by the Department, make poor growth and are apparently not well suited to our climatic conditions. On the other hand, the Suwarri nut (*Caryocar nuciferum*) grows extremely well, and fruits at an early age. This fine tree should be largely grown in Dominica, both on account of its appearance and for the well flavoured nut which it bears.

In the progress report for 1915-16, mention is made of the receipt from British Honduras, of seeds of a species of Achras, said to yield the Chicle gum of commerce. A few plants placed out in the Gardens have made fair progress, but some years may elapse before they reach an age to be tapped. Now that communications with the various Colonies are becoming normal again, it is hoped to obtain from British Honduras further supplies of seeds from trees which are known to yield the best quality gum.

SHEA BUTTER TREE.

Mention is made in the Annual Report for 1913-14 of the fruiting of the Shea Butter tree which had been received from Kew fourteen years previously. The low rate of germination of these seeds, and the very slow growth of the seedlings were commented upon.

In the report for 1916-17, reference was made to the receipt of twenty-five seeds of this tree from the Agricultural Department, Northern Nigeria, the native country of this species. The seeds proved to be considerably larger than those borne by the solitary specimen in the Botanic Gardens, and it was thought desirable to forward a sample of the seeds grown in Dominica to the Imperial Institute for comparison with the African product, and for examination and report. The information requested was kindly furnished by the Director, and is reproduced in the report.

It is necessary to point out that the Shea Butter tree in Dominica is growing under very different conditions from those of its habitat, which has a very dry climate. The rainfall of the Botanic Gardens, Dominica, is twice as heavy as those parts of Northern Nigeria in which the Shea Butter tree thrives.

The seven seedlings which are growing in the Experiment Station are healthy and promising, but in size they are very small for their age.

Considerations of the causes and conditions of heat production in plants are referred to in *Physiological Abstracts* for July 1919. The conclusion is arrived at that heat production is not dependent on any regulatory power of the plant, nor is it dependent on external conditions, but on an interplay between external conditions and specific protoplasmic properties.

From reports in the *Louisiana Planter* it appears that the work of the central factories in Cuba this year has been interfered with by the weather. Nor is the weather satisfactory from the standpoint of the cane grower, for in many parts of the island the heavy rains, while they have helped part of the present crop, have been too much for the younger cane. The unusual amount of rain received in July prevented to a great extent the cleaning of the fields necessary for the best growth of cane.

GLEANINGS.

According to *Physiological Abstracts* for July 1919, 500 tons of syrup, 350 tons of oil, 400 tons of tanning extract and 1,600 to 2,000 tons of cattle feed are annually recovered in California from the seeds of grapes used in wine making.

In connexion with the announcement made in a previous issue of the *Agricultural News* of Mr. Fishlock's promotion to the Gold Coast, it is understood that Mr. Gomez will be appointed to act in Mr. Fishlock's place as Curator of the Experiment Station, Tortola.

A useful article on bacon curing on the farm is published in the *Rhodesia Agricultural Journal* for June 1919. This article deals with suitable breeds of pigs, the curing of bacon and ham, the equipment required, methods of slaughtering, of curing and of smoking.

A Liverpool steamer arrived at Barbados on August 23 with two Southdown rams and forty Southdown ewes, for the St. Madeleine estates, Trinidad. The animals were in fair condition, but seemed to be suffering somewhat from the excessive heat which is usual at this time of the year.

Information has been received to the effect that Mr. Alfred Keys, of the Royal Gardens, Kew, has been appointed to the vacant post of Assistant Curator in the Agricultural Department, Dominica. Mr. Keys was expected to leave England by the first available opportunity after the end of July.

An arresting photograph of a Barbadian seedling cane crop growing on an estate in Jamaica appears in the *Louisiana Planter* for July 5 The field is estimated to cut over 50 tons per acre. The crop was fifteen months old. The name of the variety is not given, but the estate growing it is named Cayamanas.

West Indian cedars continue to make rapid growth on the Gold Coast. According to the Report on the Agricultural Department for 1917, the Honduras mahogany planted is a failure. Teak trees have fruited well but no mature seeds were produced during the year. *Michelia champaca* is making good growth.

According to the *International Review of the Science and Practice of Agriculture* for January 1919, an agricultural school was organized during 1918 at Charpentier, Haiti. Another school of agriculture has been established in the Department of Leon, Nicaragua, and another opened in the State of Sonora, Mexico.

The *Colonial Journal* for July 1919, states that a preliminary investigation of the bauxite deposits of British Guiana (other than those leased to the Demerara Bauxite Company) is proceeding, and that the resumption of grants of facilties to prospect and mine will be considered as soon as the investigation is sufficiently advanced.

In connexion with the West Indies and Imperial preference, several writers including the editor of the *West India Committee Circular* and Sir Edward Davson are suggesting that, in return the West Indies should admit British manufactured goods into West Indian markets at a lower rate than the manufactured goods of Great Britain's competitors.

There have been large increases since the war in the shipments of rubber from the Straits Settlements and from the East generally. For the first five months in 1918 the Straits Settlements exported 35,665 tons of rubber, while for the same period in 1919 this rose to 77,666. These figures are taken from the *India Rubber Journal* for June 28.

Labour troubles now exist throughout the world. According to the *Louisiana Planter*, July 5, trouble is being experienced on the sugar estates in that country. This is largely the result of men who have served in the army or on war service not being willing to take up their former occupations. Conditions similar to this occur in some of the West Indian Colonies.

Studies in nutrition, reported in *Physiological Abstracts* for July 1919, show that the coco-nut possesses a really high nutritive value The globulin of the coco-nut was sufficient to support the growth of rats without any other source of protein. It is stated that coco-nut press cake provides a source of protein of high nutritive value, and it also contains water-soluble and fat-soluble vitamines.

West Indian beekeepers may be interested in the trial of a system of keeping two queens in a hive, described in the *Queensland Agricultural Journal* for July 1919. It is stated that the two prolific young queens caused the production of more brood than in an ordinary colony containing only one queen. In fact, by this system it is claimed to be possible to double the number of colonies every year.

Although the full distribution of the trouble is not yet known, root disease occurs to a large extent amongst sugar-cane grown in Natal and Zululand. Attention was drawn to this originally by Dr. Tempany, Director of Agriculture, Mauritius, and the Department of Agriculture of the Union of South Africa has issued a bulletin (No. 4 of 1918) describing the disease and suggesting measures for its control. The disease appears to be caused by *Marasmius Sacchari*, but this is not definitely stated in the bulletin under notice.

A note appears in the *International Review of the Science and Practice of Agriculture* for January 1919, on the utilization of rice straw in Italy. It is recommended that rice straw should be dried and then baled. In such a condition it can be used for various purposes. It will be remembered that in British Guiana rice straw in an undried state is being increasingly used as a manure. It is comparatively rich in the essential ingredients of plant food.

CALCULATION OF ADDED WATER IN MILK.

There still occurs in the West Indies a large amount of milk adulteration, in spite of special legislation and chemical control in certain islands. In connexion with this work it seems worth while to call attention to the account of a new formula for the calculation of added water, which is given in the *Experiment Station Record*, Vol. 40, No. 5, as follows: A formula has been deduced by which the percentage of added water is calculated on the assumption that the original milk contained the minimum of both fat and solids-not-fat (3 and 8·5 per cent. respectively) If N and F equal, respectively, the percentage of solids not-fat and the percentage of fat in the milk-water mixture, X, or the percentage of milk of the mimimum standard in the original mixture, it is determined from the formula

$$X = \frac{1{,}000\ N}{3\ N\ +\ 8{\cdot}5\ (100-F)}$$

100-X then equals the required percentage of added water in the milk The probable amount of added water may be found by substituting average values for fat and solids-not-fat in place of the figures 3 and 8·5.'

The formula is considered to be more accurate than the Richmond rule, in that it introduces a compensation for any deficiency which may have been caused by the rising of cream, and the consequent depression of solids not-fat in the creamery fraction.

ADDRESS TO TRINIDAD CREDIT SOCIETIES.

A joint meeting of the Naparima and Savana Grande Agricultural Credit Societies was held on July 26, 1919, in the Victoria Hall, San Fernando. The chair was taken by His Excellency the Acting Governor, the Hon. W. M. Gordon, and there was a large attendance of cane farmers, some 400 to 500 being present.

Mr W. G. Freeman, B.Sc., Acting Director of Agriculture, addressing the meeting, said that to-day's meeting of the members of eleven Agricultural Credit Societies founded in connexion with the Usine St. Madeleine group of estates, honoured by the presence of His Excellency the Acting Governor, marked, he trusted, another definite step forward in the agricultural progress of the colony. It marked the acceptance of the principle of co-operation, or working together for their common good, by the cane farmers, a large and important class of agriculturists who were taking an increasing share in helping to maintain the sugar production of the colony. Ten years ago the cane farmers grew about one quarter of all the canes; they now grew about one-half. The future success of the industry thus evidently depended very largely on the continuance of good relationships between the factories and the farmers.

Mr. Freeman then referred to the world shortage of sugar and to the importance of central factories.

Continuing he pointed out that the development of credit societies in this district was very largely due, as they knew, to the personal interest of Mr. Moody Stuart, who had also in other ways, including the introduction of a sliding scale for their canes, helped to put cane farming on a better basis. Associated with Mr. Moody Stuart in this good work was Captain Mark Moody Stuart, whom they were glad to welcome back from active service, Mr. Forbes Todd the manager of the various estates, Mr Jones, and last but not least, Mr. Skinner, who had undertaken the duties of Hon. Secretary of all their societies.

They had thus succeeded at last in having now twelve societies in Trinidad and six in Tobago, and they would, he believed, increase and flourish to the lasting benefit of the smaller cultivators of the colony, and through them of the large estates and of the whole community. The principles on which they worked had been carefully explained to them all. He would therefore only emphasize a few of the more important points. They were as follows:

'Build up a good reserve fund out of entrance fees and pofits as soon as you can. With this to fall back on, you can later reduce the rate of interest you charge members

'Admit as members only people of good character.

'Attend your general meetings. Understand what you are doing; what sums the Society is borrowing, for you are all personally liable for their repayment.

'Select good men for your Committee, because you entrust to them the lending out of the money you have borrowed, money for which you are all responsible.

'Help the Committee in seeing that loans are used for the purposes stated.

'Be prompt in your repayments of any loans, and if impossible for special reasons for you to repay at the time an instalment is due, go to the Committee at once and explain why you cannot carry out your promises.'

If, said Mr. Freeman, they kept these few principles steadily in mind and worked honestly with one another, their Society would be a success, and they would find it a real help to them at the time when they needed money to carry out some useful purpose. Moreover, they would find the Credit Society a means of making the cane farmer more prosperous, and so increasing the welfare of the sugar industry of the colony and of the Empire.

RICE SITUATION IN DEMERARA.

In connexion with the note in the last issue of the *Agricultural News* calling attention to the scarcity of rice, the following information on the position in Demerara, published in the *Daily Agrosy* for August 16, is of interest:—

The need of the East Indian labourer for rice renders the recasting of the Government export policy very urgent, in view of the fact that the neighbouring colonies cannot look to the East for supplies. The island of Barbados which had a large supply of rice during the last harvest is at present in need of rice; and Trinidad also, with a full stock, must needs look around for sources of supply in the near future. It is estimated that the new crop, the harvesting of which will commence very shortly, will exceed previous returns by several thousand acres, and the yield per acre with the existing conditions is also expected to be very good. On the basis of last year's yield 65,000 acres, at a mean estimate of 16 bags per acre, the yield should be 1,040,000 bags of paddy, or 520,000 bags of rice. The total monthly consumption is 30,000 bags or 360,000 bags for the year, leaving a surplus of 160,000 bags or 28,800,000 lb. The quantity of rice exported during the last three years was 29,139,265 lb. for 1916; 32,182,428 lb. for 1917; 17,960,178 lb. for 1918, and 5,757,456 lb. up to the end of July last. There is at present a temporary scarcity of rice in Water Street, due to circumstances already reported—the absence of a market and the consequent refusal of holders of stock to convert paddy into rice. The position is likely to be remedied very shortly, as it is expected that country farmers will begin to bring stocks into the city.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. Mr. A. J. Brooks, the Agricultural Superintendent states that during July, work in the Experiment Stations consisted of planting sweet potatoes, rice, cassava, peas, beans, and various green dressing crops. In addition, manurial and cultural operations were performed Plant distribution included, limes, 1,300 ; grafted mangoes, 4 ; coffee (robusta), 100 ; cacao, 500 ; nutmegs, 100 ; ornamental, 29 ; miscellaneous, 2 ; rice seed, 25 lb. 6 oz. ; vegetable seeds, 137 packets. Mr. Niles has been appointed to succeed Mr. Beaubrun as Inspector of Agricultural Credit Societies. The rainfall recorded at the Botanic Gardens, Castries, during the month was 8·69 inches, and at the Botanic Station, Choisuel, 8·96 inches.

ANTIGUA. Mr. T. Jackson, Curator and Agricultural Superintendent, reports that during July plots of Kaffir corn, garlic, and Sudan grass, were planted at the Experiment Station. In addition, ordinary routine work including cultural operations was performed. The following represented plant distribution during the month : 100 Eucalyptus, 41 miscellaneous plants, 149 packets vegetable seeds, 41 packets seeds of decorative plants, 626 lb. cotton seed, 29 lb. onion seed. In the Botanic Gardens, Eucalyptus and other seedlings of economic plants were transplanted during the month. Fifty-four crates of onions were shipped by the Antigua Onion Growers' Association. During the past season the Cotton Growers' Association purchased from peasants 56,108 lb. of seed-cotton. The work of examining selected cottons has been completed. During the month 2·59 inches of rain fell, the total rainfall for the year to date being 19·55 inches.

NEVIS. The plots in the Experiment Stations have been kept in good order, and all the crops are looking somewhat better in consequence of a few showers during July, the Agricultural Instructor writes to say. The cotton in the demonstration and other plots have very much improved since the rains. There are $3\frac{1}{2}$ acres under cotton experiments, and all the crops are looking promising. During the month 600 cassava and 1,000 sweet potato cuttings were distributed from the Station. Regarding staple crops, Mr. Howell states that the young canes throughout the island are looking somewhat better since the rains, but they are still backward and need very much more rain. It is of interest to note that pen-manure is now more generally used, and every effort is made to manure all the fields. The cotton crop was very much kept back by the dry weather, but since the rain, the crop is looking very much better. A fair amount of planting and supplying was done in the lowlands during the month. Picking has begun in some of the early planted fields, but the returns will not be very great as the crop was affected by the dry weather. The cotton worm made its appearance during the month but was kept in check by poison. A few cotton stainers are found about the island, and are immediately destroyed whenever found. The rainfall for the month was 4·02 inches ; for the year to date, 15·91 inches.

BARBADOS CROPS AND WEATHER.

On Monday morning, August 25, Barbados received the heaviest fall of rain experienced for many years. In several places over 7 inches fell in the course of about five hours. Below are the returns from the various districts for 6 a.m. Monday to 6 a.m Tuesday, as published in the Barbados *Advocate* of August 27 :—

Central Police Station 7·00 inches; District A 5·33; District B 1·51; District C 98; District D 9·37; District E 3 74; Holetown 4·70 ; Bush Hall, St. Michael 10·00 ; Warrens 9·8 ; Goodland 8·10 ; Pine 8·00 ; Clapham 5 65 ; Waterford 7·00 ; Hastings, Christ Church 5·28 ; Ventnor 5·35 ; Andrews. St. Joseph 5·25 ; Carrington, St. Philip 1·10 ; Three Houses 1·00.

The extraordinary variations in the quantity of rain received at the different stations will be at once noticed.

This was due to the rain falling in two extremely heavy showers, of limited area, which approached the leeward coast of the island from the south.

Such heavy showers from an agricultural point of view do more harm than good. They also cause much damage to house property, and especially to roads which, in Barbados, was quite bad enough as it is, without being made worse by the weather

Writing on weather and crops during August previous to this downfall, the Barbados *Agricultural Reporter* for August 23, in referring to the heavy showers received throughout the month, says :—

'There has been, indeed, a magic change in vegetation of every kind. Even the driest districts are putting on their best garb, and, so to speak, whispering words of hope to many a despondent planter. There can not be the return from certain crops which would, under other circumstances, have been reaped ; but, with the continuance of favourable weather, cereals, greens and fodder should do well and assist in relieving the present strained situation.

'The wet weather during the past fortnight, while it hindered progress in ploughing on one or two occasions, has not interfered with other forms of agricultural work on the estates. Fair progress seems to have been made with the opening of cane holes, but on some estates there are some fields which are very grassy. Some of these have not been touched in any way since the canes were removed, but others, in which holes have been already opened, are also in this condition. The rainy weather has induced the rapid growth of grass, and some planters find it very difficult, sometimes impossible, with the amount of labour at their disposal, to keep the grass under control. Of course, a good deal depends on the way in which an estate is kept. We know of some planters who have been undisturbed in this respect because their fields have been well cleaned for years past.

'With the change in the weather there has come a most pleasing and welcome change in the condition of the young cane crop. Some planters in the more favoured districts of the island are expecting, that with the continuance of good weather, their crops next year will bear a favourable comparison with this year's results. Verily, our planters are like those sensitive instruments which indicate weather changes,—easily depressed, but as easily made buoyant.

'The corn crop is developing well, but there are some fields which have grown very irregularly. In all probability the seed was not healthy. The finest field which has come under our observation is at Hope in Christ Church. Here and there are fields which have begun to bloom, but, except for roasting purposes or for the boiling of the famous corn soup, no reaping has been done. Our peasants should be warned not to indulge in the eating of young vegetables of any kind.

'Potatoes everywhere are growing vigorously. In the black soil some fields of yams have grown irregularly and have been supplied with potato slips.

'During the weather of July, the spires of the yams in some peasants' holdings in Christ Church were so nipped that they planted cotton through them so as to ensure a crop of some kind'.

THE WEATHER AND THE MOON.

Barbados is luckily situated in regard to experts. It not only possesses expert agriculturists, expert politicians, and expert road-makers, but also an expert astrologer, who is at the same time an expert weather-prophet. The heavy rains on August 25 last were foretold by this astrologer, who based his prognostications on the phase of the moon at that date. This has naturally created a considerable impression upon a large number of people, and we therefore feel it our duty to reproduce the following extract taken from the *Monthly Weather Review* of the Weather Bureau, United States of America:—

During the past century there has been such steady progress in all branches of science that the more intelligent portion of the community has abandoned those notions with regard to astrology, alchemy, spontaneous generation, witchcraft, and other philosophies, that were formerly accepted by the most learned. The diffusion of education has raised the children of the present generation above the level of the philosophers of a former generation. And yet we have seen it demonstrated again and again that the popular majority does not fully appreciate the extent of our present knowledge of the laws of the weather, and is still liable to resort to unscientific methods in the hope of accomplishing that to which science has not yet attained.

We have seen communities in America and Australia carried away with the idea that cannonading can produce rain or in Europe that the ringing of church bells or the offering of prayers can avert droughts and floods. In Southern Europe the agriculturists are but just recovering from the strange belief that hail can be prevented by shooting rings of smoke towards the clouds. During the past ten years a wealthy engineer of Russia has devoted his fortune to the conversion of the people to his idea that the moon controls the weather, and so seriously does his advocacy of this error affect the uneducated agricultural community that the Director of the Weather Service at Odessa (Klossovsky) has gone to the trouble of publishing an elaborate statement of the errors in fact and theory committed by this engineer. He shows very clearly that Demtchinsky's method of predicting the weather by lunar periods amounts to nothing more than predicting an average condition, an average which very rarely occurs, whereas, the departures from it are very frequent. The verifications of these predictions are like the combinations in an ordinary game of chance, where there is an equal number of heads and tails or hits and misses

'As the collection of meteorological statistics depends largely upon the voluntary work of thousands of unpaid observers, it is to be feared that the good work we are doing in America may be seriously interrupted, if erroneous views are allowed to have an influence in this country as profound as they seem to have in Southern Russia.

We cannot repeat too often and too clearly the general proposition that meteorology is to be advanced only by studying in details the effects on the atmosphere of insolation, radiation, the diurnal rotation and annual revolution of the earth, and the presence of continents and oceans.

Since the above was written—sixteen years ago—great advances have been made, especially during the war, in the study of weather by investigating the upper atmosphere by means of aircraft. The atmosphere is really an ocean of gas, and we live at the bottom of it as some animals live at the bottom of the sea. We can no more obtain a correct idea of the movements and properties of the air by investigation at the bottom only, any more than we can of the sea by confining our studies to observations at the surface.

There is not much scope for weather forecasting in the West Indies, except in the case of cyclonic disturbances around August and September. In the usual way the weather is very uniform. But in northern countries there is, and the meteorological services have reached a high standard of efficiency. This has been attained, not through astrology and witchcraft, but through the application of scientific ideas, and the collection and critical study of an enormous number of observations.

A MATTER OF RAINFALL.

We reproduce below a letter to the Editor of the Barbados *Advocate*, which will astonish those readers who are not familiar with the weight of rain :—

Dear Sir,—The following may be of interest to the general public. It is a small sum in arithmetic, referring to the weight of rain on a particular area:

1 acre = 4,840 sq yds. = $4\,840 \times 9 \times 144$ sq. inches.

If the rain is 1 inch deep this of course represents the number of *cubic* inches of rain over 1 acre. The above number in cubic feet is

$$\frac{4,840 \times 9 \times 144}{1,728} = 3,630 \text{ cubic feet.}$$

Now 1 cubic foot of water weighs 100,003 lb. ∴ weight in tons $= \frac{3,630 \times 1,000}{16 \times 2,240} = 101\frac{1}{4}$ tons (nearly).

Thus 10 inches of rain, on an average estate of, say 200 acres, weighs $101\frac{1}{4} \times 10 \times 200$ tons = 202,500 tons. Two hundred and two thousand, five hundred tons!

No wonder the cottages go!! 'Fluvius.'

A Durable Fibre.—A plant called the olona (*Touchardia latifolia*) grows only in Hawaii, and supplies a textile fibre generally considered to be the strongest and most durable known. The olona belongs to the moisture-loving group of the Hawaiian flora so common in the mountain forest. The fibre is used for numerous purposes, especially for fishing lines and nets on account of its great resistance to salt-water. The fibre is removed by maceration of the stems in running water, and by removing the pulp by scraping. The chief qualities of the fibre are: its great tensile strength eight times greater than that of hemp; its great resistance to salt water; its pliability and consequently, its suitability for spinning by hand. (The *International Review of the Science and Practice of Agriculture* for January 1919).

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, July 24.

BALATA—Venezuelan Block, no quotations ; West Indian Sheet, 3*s.* 11*d.*
BEESWAX—No quotations.
CACAO—Trinidad, no quotations; Grenada, no quotations.
COPRA—£60
HONEY—Jamaica, 92*s.* to 99*s.*
LIME JUICE—Raw, Quietly steady ; Concentrated, no quotations.
PIMENTO—5½*d.*
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD, June 24, 1919.

BAY OIL—13*s.* 6*d.* to 14*s.*
LIME OIL—Cheaper, at 4*s.* to 4*s.* 3*d.* for West Indian distilled, and 11*s.* 6*d.* to 12*s.* for hand-pressed.
ORANGE OIL—West Indian, 8*s.*

Barbados.—Messrs. T. S. GARRAWAY & Co., August 20.

ARROWROOT—$8·60 per 100 lb.
CACAO—$21·00 to $24·00 per 100 lb.
COCO-NUTS—$36·00 husked nuts.
HAY—$4·50 to $4·75 per 100 lb.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations
SUGAR—White Crystals—$8·00.

Trinidad.—Messrs. GORDON, GRANT & Co., July 4.

CACAO—Venezuelan, $26·00 ; Trinidad, $24·50.
COCO-NUT OIL—No quotations.
COFFEE—Venezuelan, 20c. per lb..
COPRA—$9·00 per 100 lb.
DHAL—$10·50.
ONIONS—$9·00 to $9·25 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $5·00 per 100 lb.
RICE—Yellow, $12·00; to $13·00 White, $12·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., July 30.

CACAO—Caracas, 26c. to 26½c.; Grenada, 25¼c. to 25½c.; Trinidad, 26c. to 26¼c.; Jamaica, 21½c.
COCO-NUTS—Jamaica selects, $75·00; Trinidad $75·00 culls, $52·00 per M.
COFFEE—Jamaica, 24½c. to 27½c. per lb.
GINGER—18c. to 21c. per lb.
GOAT SKINS—Jamaica $1·90; Antigua and Barbados, $1·80; St. Thomas and St. Kitts, $1·80.
GRAPE FRUIT—Jamaica, $6·00 to $7·50.
LIMES—$6·00.
MACE—42c. per lb.
NUTMEGS—19½c.
ORANGES—$4·00 to $5·00.
PIMENTO—8¾c. per lb.
SUGAR—Centrifugals, 96°, 7·28c; Muscovados, 89°, 6·00c. Molasses, 89°, 5·715c. all duty paid.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

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CONTENTS.

	PAGE.		PAGE.
Amrat Mahal Cattle ...	295	Insect Notes :—	
Book Shelf	292	Food of Tiphia and Campsomeris ...	298
British Guiana, Developing	296	Insects Attracted by Smoke	298
Camels, Draught... ...	295	Jamaica Export-, Recent	299
Canadian Trade Prosperity	296	Mahoganies, The True ...	296
Coir Fibre Machinery ...	291	Manurial Experiments, Disturbing Factors in	302
Cotton Notes :—		Market Reports	304
Cotton Exports from the West Indies ...	294	Mischief of Wrong Theories, The	289
Meade Cotton	294	Motor Tractor for St. Vincent...	301
Cowpea Preservation ...	303	Nitrogen Fixation in Tropical Soils	297
Credit Societies, Deposit System for	299	Notes and Comments ...	296
Department News ...	293	Plant Legislation in Dominica	292
Departmental Reports ...	300	RubberResearch in Malaya	297
Fisherman-Fish, The ...	293	Tractor Demonstration in Barbados	301
Forestry in Trinidad ...	291	West Indian Products ...	303
Gleanings	300		
Hawaii, Industrial Development of	299		

The Mischief of Wrong Theories.

PEOPLE who persist in spreading false theories are responsible for a serious offence. The offence is against society, against education, and against scientific research. In short, such people tend to retard the advancement of civilization.

The degree of guilt becomes greater if the supporters of false theories persistently spread them in the face of incontrovertible evidence that they are wrong. Their action then becomes either a moral crime, or else an indication of feeble-mindedness.

In the last issue of the *Agricultural News* we referred to the harm that resulted in Russia some year's ago through a wealthy individual devoting his money and ability to the purpose of spreading theories in regard to the moon and the weather. It is unnecessary to discuss the supposed effect of the moon upon weather here. We shall content ourselves by pointing out that no credence is given to the supposition in standard works on meteorolgy. Yet we frequently hear in the West Indies even educated people supporting the idea. Occasionally these defenders of the theory go further and deprecate the system of hurricane detection of these islands, and denounce the practical value of meteorological instruments.

Action of this sort is very harmful to the people and to those responsible for their education. It is also, very irrational, for it is hardly likely that able men would devote their energies to meteorological research, and less likely still, that Governments would vote large sums of money to provide for this work, if it were not productive of useful results. It would surely be much easier and very much less expensive to forecast the weather with calendars from arm-chairs.

One frequently hears people in course of general conversation supporting theories equally as false as the weather and the moon idea. Amongst these, wrong theories concerning spontaneous generation, telegony and the origin of species may be enumerated.

If one places a piece of freshly-boiled sweet potato in a sterilized bottle and corks it down, it is quite likely that after a few days mould of some sort will make its appearance on the piece of vegetable. There are many people prepared to argue that, since the boiling destroys life, and since the bottle has been sterilized, the appearance of the mould is an instance of spontaneous generation. What has happened, is that the resistant spores or 'seeds' of certain fungi or bacteria have withstood the heat and have germinated; or another explanation might be accidental infection during the manipulation. So far as we know at present, there is no such thing as spontaneous generation. Life will never arise in thoroughly sterilized material that is protected from re-infection.

Telegony is a subject that often gives rise to very heated discussions between scientists and breeders. In particular, it is a theory which is firmly believed in by breeders of dogs.

Its principle is that females are impregnated in some way by the first males to which they are bred, so that all their subsequent offspring, regardless of their actual father, will show influence of the first male. Space will not permit a discussion of the subject here*, but it may be definitely stated that a previous gestation of a female carries with it no predetermined effects; there are no other progenitors but the direct one. The first gestation may possibly have some constitutional effect upon the mother and modify the environmental conditions under which a new foetus develops in the womb; but that the gametic constitution of this progeny is affected, we have no evidence whatsoever.

In spite of this being true, we continually hear persons contending an opposite opinion. Most of these people have never studied the subject from a detached, scientific point of view—they often base their views on a single incident in their experience, the conditions surrounding which were probably uncontrolled, making any important inferences quite unreliable. The harm done through this obstinate tenacity to pet theories cannot be overestimated.

There are other people at the present day who still hold to ideas of the Middle Ages in regard to the origin of species. They actually believe in the Adam and Eve origin of mankind; that the world was made in six days, and so on. The most superficial study of biology and geology will suggest the evolutionary origin of living things, while a study of the standard works on the subject will convince those who are sufficiently educated and intelligent to understand.

Another 'die-hard' is the miasma theory of malaria. In this theory the cause of malaria is attributed to a miasma or mist which rises from swamps and marshes. It was very natural for the earlier observers to get this idea, for the prevalence of malaria is, as we know, closely associated with the presence of stagnant water. But the true nature of this association was only realized after the discovery of the causative organism of malaria, and after the still greater discovery that it is transmitted to man by the Anopheles mosquito. Anopheles, like all mosquitoes, breeds in still water. Therefore, if there is no still water there can be no Anopheles; and if there are no Anopheles there can be no malaria. In spite of adequate proof of the facts underlying this reasoning, it is possible to find even medical men who still adhere to the theory of miasma. The mischief caused by a wrong theory like this is very great indeed. It tends to shake the public's belief in the sanitary measures so essential for the prevention of malaria. It is particularly harmful when the majority of the people are half-educated natives. These people are only too ready to accept as true the simplest and most primitive of explanations. It is almost as harmful to spread the miasma theory amongst natives in the tropics as it would be to spread malaria itself.

The mischief of wrong theories is not confined to physical and biological matters. There is a great deal of harm done by means of wrong socialistic ideas. The notorious one of the present day is Bolshevism. The equal division of wealth is impossible as a permanent condition. The Russian attempts to enforce it are criminal and insane. Even the less violent but none the less destructive policy of certain sections of labour in Great Britain is partly based on wrong theories. Those who spread these wrong theories are responsible for the great economic losses that that country is now experiencing.

We cannot refrain from suggesting that wrong theories underly some of the socialistic articles that appear in West Indian newspapers. The effect of these articles is merely to cause agitation and unrest amongst those who are at present least fitted for greater responsibilities. The articles have no educational or constructive value. The object of the press should

*The reader is referred to a fairly exhaustive article on the subject by Dr. Etienne Rabaud in the *Journal of Heredity*, Vol. V, pp. 389-99.

be to uplift public opinion, not to bring about its disintegration. In the past, labour, throughout the world, has been treated unfairly. Labour has a strong case for demanding better conditions. These conditions are to be realized by labour increasing its efficiency, by working more and saving more, and by stating its just demands in a united voice. Better conditions are not to be gained by policies that lead to reduced output, squander, militant strikes, and demonstrations of the Bolshevik sort.

The reader will now see that the seemingly harmless idea of forecasting the weather by means of the moon's phases, referred to at the beginning of this article, has a very wide and important significance. Underlying it is a big principle, and that principle is: wrong theories may cause endless mischief. Before we accept a theory let us be sure that it is sound; let us examine the facts on which it is based, and seek the opinion of the best authorities. If it will stand the light of such a test, it may be taught and acted upon; if it will not, it should be shelved as a relic of merely historic interest.

COIR FIBRE MACHINERY.

Particulars have been received from London in regard to machinery for turning out coir fibre. One estimate is for a complete set of Lehmann's machinery to work up 10,000 coco-nut husks in twelve hours and to produce 2,000 lb. of coir fibre ready for the market. This machinery consists of: one 15 h.p. engine and boiler combined, together with all shafting, pulleys and belts; one husk crusher; ten extractors No. B, two extractors No. B^1; one willow; one drying machine; one hydraulic press box, and pumps. Gross weight of this machinery 23 tons; shipping measurement 2,144 cubic feet; price £3,151 including packing, cases, and delivery free in Liverpool. This price is subject to a commission of 10 per cent. presumably owing to fluctuations in the price of machinery just now, as the result of unsettled conditions of production.

It is noticed that the extractor B is constructed for working by hand, but there should be no difficulty in making the necessary alterations for driving it by power.

The different operations in turning out coir fibre were fully described in the *Agricultural News*, for July 12, 1919, p. 214, in connexion with an account of some coir fibre factories in Trinidad.

It may be noted that the makers of the machinery referred to above, sell a coir-fibre rope-making machine. Each machine is claimed to turn out about 3,250 yards of rope in ten hours. All descriptions of fibre can be used in these machines. The cost of the machine varies according to the diameter of the rope produced. A machine for ¼-inch rope costs £330; one for 1-inch rope £540.

The Imperial Department of Agriculture for the West Indies will be glad to give further information on coir-fibre machinery to those who may require it.

FORESTRY IN TRINIDAD.

The following is reproduced from the Report of the Conservator of Forests, Trinidad, for 1918:—

From the beginning of the year the Forestry Branch of the Crown Lands Department became the Forest Department.

The revenue amounting to £9,628 shows a satisfactory increase of £1,484 or 19 per cent., compared with £7,784 or an increase of £778 or 11 per cent. in 1917. The increase is due to a greater demand for native timber owing to the high price of imported lumber on account of the War.

The total expenditure was £4,869 against £4,924 in 1917—a decrease of £55. The surplus was £4,399 compared with £2,860 in 1917. The total surplus of the last nine years now amounts to over £25,000.

The area of plantations has been increased by 84 acres and now amounts to 572 acres. Of the increase 24 acres consists of open plantations after clear felling, and 60 acres of plantations under a shelterwood.

The estimated stock of planted trees from one to eleven years old is 180,085 on 572 acres, compared with 141,797 on 488 acres in 1917—an increase of 38,288.

The East Indian Teak (*Tectona grandis*), introduced from Burma in 1913, continues to do well. There are now 13,046 on the plantation. The average girth of the trees measured at 5 feet from the ground on a 5-acre plantation was found to be 14½ inches. The trees are five to five and a half years old from date of sowing the seeds, and are from 30 to 50 feet high.

About 1,000 young teak were raised from seeds collected from trees grown on the plantations.

In addition to the plantation work dealt with in another part of this report, an improvement felling of 1,200 acres in the Southern Watershed Forest Reserve has been carried out. This together with the 1,200 acres done in 1917, and 160 acres in 1916, makes a total of 2,560 acres so far covered by improvement fellings.

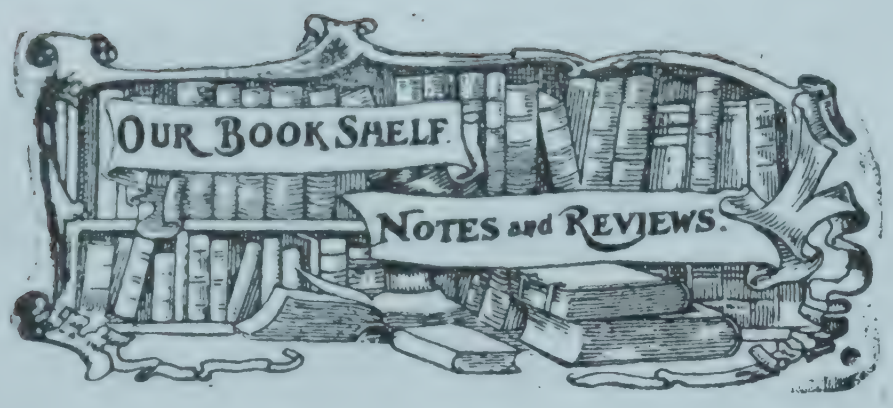
The operation consisted of the cutting of creepers and the girdling or felling of trees of inferior species that were interfering with the healthy development of the natural regeneration (i.e. self-sown seedlings) of cedar and other valuable species, and the letting in of more light on the leeward side of patches of natural regeneration to encourage the growth of more seedlings of valuable species. The seedlings over 2 feet in height and under 2 feet in girth that were standing over 10 feet apart were counted. In addition to these, there are doubtless many thousand seedlings of less than 2 feet in height, a proportion of which will eventually develop into trees.

The cost of improvement fellings for 1918 was £411 6*s.* 10*d.* per acre, and worked out at one penny per plant.

Owing to the increased area of plantations, the improvement felling and the work connected with the substantially increased revenue, it has not been possible to do any new demarcation of forest reserves during the year.

In accordance with instructions, proposals have been submitted for the reservation of approximately 42 square miles of forests, either as protection reserves, or for the supply of timber and other forest produce on poor soil unfit for cultivation in anything but a timber crop.

These proposals were approved, and the areas were marked approximately on the Ward Plans and reserved from sale.



(1) *AN OUTLINE OF THE HISTORY OF PHYTOPATHOLOGY.* By Herbert Hice Whetzel. Philadelphia and London: W. B. Saunders Company, 1918. Pp. 130 with 22 portraits.

(2) *FUNDAMENTALS OF BOTANY.* By C. Stuart Gager. Philadelphia: P. Blakiston's Son & Co., 1916. Pp. 640 with 437 illustrations.

(3) *PLANT PHYSIOLOGY.* By Vladimir I. Palladin. Edited by B. E. Livingstone. Philadelphia: P. Blakiston's Son & Co., 1917. Pp. 320 with 173 illustrations.

These books represent three of the best recent works on general botany and plant physiology. The instructive value and general interest of the books are ensured by original presentation of the subject-matter, and by the large number of excellent illustrations.

(1) The author has successfully endeavoured to set forth in outline the most outstanding features in the evolution of this branch of botany, and to indicate the proper relation thereto of the men who have chiefly shaped its progress up to the year 1912.

(2) Mere inspection of this book will satisfy the teacher as to its high merits for educational purposes. It is to be strongly recommended as a textbook on general botany. It is the most comprehensive book we have seen, and its study should induce a really broad grasp of the science.

(3) This is regarded as a standard work on plant physiology, and its author is a famous Russian botanist. A great deal of attention is given to the chemical aspects of physiology.

PLANT LEGISLATION IN DOMINICA.

The first step in the direction of plant protection was taken in 1898, when Act No. 3 was passed to provide against the importation of articles likely to introduce diseases among plants. Under the authority of this Act, a Proclamation dated August 27, 1898, prohibited the importation from Ceylon of plants, seeds, berries, earth, and soil. This Act was suspended by Law No. 9 of 1904, in which provision is made for the fumigation and disinfection of imported plants, cuttings, buds, grafts, bulbs, roots, and seeds, and their packages: also fruits and vegetables intended for propagation and not for consumption as food.

Under Law No. 6 of 1907, power is conferred to prohibit by proclamation, the importation of plants, cuttings, bulbs, roots, seeds, or berries, or any earth or soil, or any articles packed therein, or any packages, or other articles or things likely to be the means of introducing any plant disease.

A Proclamation dated February 5, 1909, under No. 6 of 1907, prohibits the importation into Dominica of all plants from Dutch Guiana which are likely to be a means of introducing disease from that country.

A Proclamation dated October 26, 1910, prohibits the importation of banana plants and suckers from all countries of Central or South America, and from the island of Trinidad, also of coco-nuts in husk and all growing plants or parts of plants of coco-nuts, from Cuba, Jamaica, Trinidad, and all countries of Central or South America.

A Proclamation dated August 7, 1915, prohibits the importation of citrus plants and citrus budwood from the United States of America. This is superseded by a Proclamation dated October 9, 1916, which applies to citrus plants, citrus budwood, or citrus fruit, or any parts of such plants, from the United States of America, Cuba, Jamaica, Haiti, San Domingo, and Porto Rico.

A second Proclamation of the same date restricts, under certain conditions, the entry of rooted plants from the countries named in the above Proclamation.

A Proclamation dated October 29, 1917, prohibits the importation of seed-cotton or cotton seed from all countries or places outside the Colony of the Leeward Islands, save and except from some other Presidency of the Colony, or from the Colony, of Trinidad and Tobago and its dependencies, or from the Colonies of Grenada, St. Vinceent and St. Lucia, provided, however, that small quantities of cotton seed for experimental purposes may be imported into the Presidency of Dominica, on the written permission of the Superintendent of Agriculture, on such terms and conditions as he may prescribe.

A Proclamation dated March 8, 1919, prohibits the importation from any country, save and except the islands of Montserrat, St. Lucia, and Grenada, of any citrus plants or parts thereof, including the fruits thereof, as these are likely to be a means of introducing the plant disease known as 'Blossom Blight' and 'Wither-Tip Disease'. It is, however, allowed that the Curator or Agricultural Officers shall have the power to import for scientific purposes anything thus prohibited, on his making a report of such importation for the information of the Governor.

A Proclamation dated March 8, 1919, prohibits the importation from the islands of Trinidad and Grenada of growing and sprouting coco-nuts, as likely to be a means of introducing the plant disease known hitherto as 'Root disease of coco-nuts', but to be called in future the 'Red Ring disease of coco-nuts'.

With regard to the export of plants, it is only necessary to state that such cannot be admitted into the United States unless accompanied by a certificate showing that they have been inspected by a duly authorized official, and found free from injurious plant diseases or insect pests.

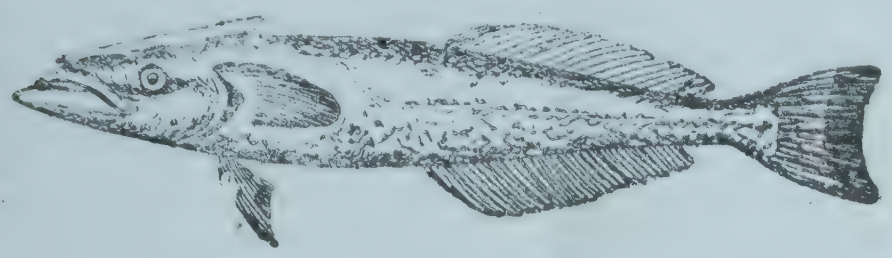
Persons wishing to export plants to the United States from Dominica should notify the Curator of the Botanical Gardens, who will arrange for the inspection, and the issue of the necessary certificates.

The importation of nursery stock into the United States by mail is prohibited. (Report on the Agricultural Department, Dominica, 1918-19.)

According to an article in the *Journal of the Board of Agriculture of British Guiana* for April 1919, genuine milk scalded once and left standing for a period not exceeding eight hours, when freed of that portion of the cream which is to be found on the surface, remains genuine; on standing for over eight hours and not exceeding twenty, it does not alter in its composition as regards either its fat content and specific gravity, to a sufficient extent to enable analysts to return the sample as below the legal standard.

THE FISHERMAN-FISH.

In the waters of Mozambique on the East Coast of Africa, fishermen use free-swimming fish to catch other fish. These fishermen-fish, or 'Chagos' as they are called locally belong to the genera Echeneis or Remora, which are distinguished by a cephalic sucker on the head, by means of which these fish can attach themselves and can stick with extraordinary tenacity to boats, or to sharks, turtles, cetaceans and other swift-swimming animals. The appearance of a fisherman-fish is shown in the first illustration below. They are about 3 feet in length.



A Fisherman-Fish (*Remora* sp.).

To recent issues of the *American Naturalist*, Mr. E. W. Gudger, of the American Museum of Natural History, New York City, has contributed a series of papers on the use of sucking-fish for catching fish and turtles. The native fishermen of Zanzibar, he states, keep their 'Chagos' in water-containers in their canoes, and are so tame as to come to the surface of the water at the appearance of their masters, by whom they allow themselves to be freely handled. When being employed for hunting, a line is attached to a ring or loop fixed just above the tail, the fish being kept in vessels of water which is frequently renewed. The fishermen then sail their boats to regions frequented by turtles. These animals have the habit of sleeping at the surface of the water on which they float, and their sleep is so light that the least noise of an approaching fishing boat is sufficient to wake them and cause them to flee to great distances, or to plunge to great depths. At a distance sufficient to prevent this disturbance, the fishermen put their 'Chagos' in the water, and these, delivered in part from their captivity, seek to escape by swimming in all directions. The

The Earliest Illustration. (A.D. 1558.)

line is then paid out to a length of cord equal to the distance which separates the sea-turtle from the boat of the fishermen. The 'Chago', retained by the line, makes at first new efforts to get away from the hand that masters it. Soon, however, perceiving that its efforts are in vain, and that it cannot free itself, it travels around the circle of which its cord is, so to speak, a radius, in order to meet some point of adhesion, and consequently to find rest. It finds this asylum under the plastron of the floating turtle, to which it attaches itself by means of its sucker, and gives thus to the fishermen, to whom it serves as a fulcrum, the means of drawing to them the turtle by hauling in the cord.

The accounts (of which the above is only one) of the use of Remora as a hunting fish off East Africa, are not the first that we have of such employment. For the very beginning it is necessary to go back to the second voyage of Columbus to the West Indies in 1494. Rather later accounts refer to the use of this fish in Jamaica and Cuba. The first known figure of fishing with the fisherman-fish is reproduced below in the opposite column, and is after Gesner, 1558.

Here the hunting fish is depicted in a conventional and exaggerated form, especially the sucker, which is figured as a hood. The animal being attacked is supposed to be a porpoise. The astonished attitude of the turtle will be noticed; also the smile on the face of the fisherman-fish.

Enquiries made recently in the Lesser Antilles have indicated that nothing is known of these fishermen-fish at the present day in West Indian waters. Species of Remora certainly have a wide distribution in tropical seas, as Mr. Gudger's most interesting historical account proves. The subject is deserving of investigation, for it is possible that the use of Remora for turtle and other fishing in the West Indian islands to-day might be of very considerable economic value, and it certainly would afford a very interesting and exciting form of sport.

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department, returned to Barbados on September 4, 1919, by SS. 'Guiana' after a visit to St. Lucia in connexion with general entomological investigations.

Mr. W. Nowell, D.I.C., Mycologist on the staff of the Imperial Department, returned to Barbados on September 14, 1919, by SS. 'Saba' after four months leave spent in England.

Mr. Nowell is expected to be leaving again for Trinidad on September 19, for the purpose of continuing his investigations on froghopper and root disease in that Colony.

Mr. S. C. Harland, B.Sc., Assistant for Cotton Research on the staff of the Imperial Department, arrived in Barbados on September 16 from the Northern Islands *en route* for St. Vincent. This officer left for that Colony by the C.R.M.S. 'Caraquet' on the same day.

Mr. Alfred Keys, of the Royal Gardens, Kew, arrived at Barbados by SS. 'Saba' from England on September 14 *en route* for Dominica, where he will take up the duties of Assistant Curator in the Agricultural Department.

Mr. Keys will proceed to Dominica by first opportunity.

COTTON NOTES.

COTTON EXPORTS FROM THE WEST INDIES.

The following figures show the quantity and estimated value of Sea Island cotton exported from the West Indies for the quarter ended June 30, 1919:—

Colony.	Quantity in lb.	Estimated value, £.
Grenada	1,595	240
St. Vincent	234,943	35,264
Barbados	35,569	5,928
Montserrat	71,504*	8,699
Antigua	71,250	10,688
St. Kitts	71,519	10,728
Nevis	73,609	11,041
Anguilla	1,530	230
Virgin Islands {seed-cotton 1,688 lb. † / 4 = 422 lb. + 1,872 lb.}	= 18,594	2,703
Trinidad	nil.	nil.
	580,113	85,521

Besides the above there were also exported from Grenada, 268,128 lb. of Marie Galante cotton, of an estimated value of £10,406, and from St. Vincent, 21,679 lb. of Marie Galante seed-cotton equal to 5,420 lb. of lint., of an estimated value of £452.

Barbados also exported 3,150 lb. of linters valued at £89, and the Virgin Islands 4,202 lb. of native cotton valued at £315.

*The cotton exported from Montserrat comprised 46,493 lb. of clean lint valued at 3s. 4d. per lb., and 25,011 lb. stained lint valued at 1s. per lb.

†Sea Island seed-cotton equal to 422 lb. of lint, as shown above.

MEADE COTTON.

The Empire Cotton Growing Committee has circulated for general information, the following important extracts from recent publications of the Bureau of Plant Industry, United States Department of Agriculture, and from *Science* (July 5, 1918). Study of the facts given below will suggest that Meade cotton may possibly enter into competition with the West Indian Sea Island products:—

This name has been given to a new Upland long-staple variety representing the nearest approach to Sea Island cotton in length and fineness of fibre. The original selection was made in 1912, at Clarksville, Texas, in a field of a variety locally called 'Blackseed' or 'Black Rattler', but not the same as the varieties that have borne these names in other parts of the cotton belt.

Mr. Roland M. Meade, of the Bureau of Plant Industry, was the first to appreciate the possibilities of breeding a superior type from this stock, and the work was well under way at the time of his death in June 1916. The variety has been named Meade in his honour. As now grown in the South-eastern States, it produces lint averaging $1\frac{5}{8}$ inches in length. The fibres are exceptionally uniform, with little or no tendency to 'butterfly' (due to short fibre at the base of the seeds), which was one of the undesirable traits of the older long-staple varieties, such as Floradora, Sunflower, and Allen. The seeds are large and brownish black, being only slightly tufted with white fuzz at either end, like the seeds of the Sea Island and Egyptian cotton, so that it is possible to use the roller gins with which the Sea Island growers are already equipped. The only difficulty arises from the fact that the Meade seeds average somewhat larger than the Sea Island, but this can be avoided by a slight modification of the ginning equipment.

Under boll weevil conditions in Georgia, the Meade has given excellent results, yielding three to four times as much as the Sea Island cotton when planted in alternate blocks, so that careful comparisons could be made. The lint has been received on the Sea Island markets of Georgia in competition with Sea Island cotton, with very favourable comments. Several bales of the Meade were sold in Savannah in 1917, at a premium of $\frac{1}{2}$-cent above the current price of Sea Island cotton The following is a description of the variety: Plant erect, of average height, with regular internodes of medium length on both the main stalk and on the vegetative branches. Internodes of the fruiting branches rather long, with little tendency to take the shortened 'cluster' form. Leaves of medium size and rather thin texture, not deeply cut, a larger proportion with only three lobes than in most varieties. Involucral bracts of medium size not exceeding the bolls, with ten slender teeth. Bolls medium size with a thin bur, opening readily even under humid conditions. Seeds large, about 3,000 to the lb., nearly naked after the lint is removed, brownish black, slightly tufted at either end. Lint $1\frac{1}{8}$ to $1\frac{11}{16}$ inches in length, uniform, with good lustre, slightly heavier bodied than Sea Island cotton, scarcely distinguishable from Sea Island when properly ginned. Lint percentage 26; lint index 5·5.

In comparison with alternate blocks of Meade and Sea Island cotton grown near Valdosta Ga., in the season of 1917, Meade was picked two weeks in advance of the Sea Island, and yielded almost twice as much, 230 lb. as compared with 117 lb. Picking is easier because the Meade bolls are about twice as large as the Sea Island. Ten 4-locked bolls of the Meade variety yielded 65·7 grams of seed-cotton compared with 35·7 grams from ten 4-locked bolls of Sea Island, but 75 per cent. of the Sea Island bolls have only three locks. The Meade has 75 per cent. of 4-locked and 25 per cent. of 5-locked bolls. On account of the larger size of the seeds, the lint percentage is lower in the Meade than in Sea Island cotton—at Valdosta 26·8 per cent. for the Meade and 30·7 for Sea Island. This is at the rate of 1,365 lb. of seed to a 500 lb. bale of Meade, compared to 1,111 lb. of seed from a 500 lb. bale of Sea Island cotton. The oil content of the Meade seed is unusually high, about 24 per cent. having been reported. Both varieties yielded fibre of the same length, $1\frac{5}{8}$ inches.

In order to be a successful competitor with Sea Island cotton on the Sea Island markets, it is necessary that the Meade cotton be harvested and ginned in the same manner, and with care equal to that with which the Sea Island is usually handled.

That the Meade variety was not produced by hybridization but by the discovery and selection of a superior type already existing, is of interest in relation to the heredity. Confusion is likely to arise as already shown by unauthorized statements appearing in newspapers and agricultural

journals, in which the Meade variety appears as a new early Sea Island cotton, or as a hybrid between the Upland and Sea Island types.

The usual reasoning in such matters is to assume that a variety like Meade must be a hybrid because the plant is like Upland cotton and the lint like Sea Island, but the uniformity of the Meade cotton at once places it in a different class from any stock known to have a direct hybrid origin.

The need of combining the superior fibre of the Sea Island or Egyptian types of cotton with the superior cultural characters of the Upland type has appealed strongly to breeders, and many attempts have been made to secure this result by hybridizing different Upland varieties with Sea Island or Egyptian sorts. Crossing is readily accomplished, and the results usually appear promising in the first and second generations. Thousands of natural and artificial hybrids have been raised, compared, and selected, and progenies of such hybrids have been carried through numerous generations, but without finding any hybrid stock with a sufficiently uniform and stable combination of the desirable characters of the parental types to justify commercial planting. While it is doubtless true that need of uniformity is greater with cotton than with any other crops, on account of the industrial uses of the fibre, the failure to secure sufficiently stable combinations of characters from hybrids between widely different types may be significant.

AMRAT MAHAL CATTLE.

This breed of cattle was imported into Antigua about the year 1912, and the importation consisted of one bull and one cow. At the present time the original owners, Messrs. Henkell Du Buisson & Co., possess three pure-bred bulls, two pure-bred cows, and one pure-bred heifer. In addition, there are numerous half-bred animals in the original herd, and two half-bred bulls have been sold locally. None of the progeny of these animals has been exported, but numerous enquiries have been received as regards price, etc., from the French islands.

A Mysore Bull.

In the 'Cattle of Southern India', Lieutenant-Colonel W. D. Gunn, Superintendent, Indian Civil Veterinary Department, Madras, gives a description of the animals. He states: 'As dairy stock, the cows are insignificant, being very poor milkers, the whole of the milk being barely sufficient to nourish the calves. The milk is very rich and sweet. The bull is not used until he is five years old, and he is said to retain his vigour until he is ten, after which he is castrated and discarded from the herd.

'In disposition the cattle are wild, unruly, and impatient in the presence of strangers; (this is not so in Antigua: they are particularly quiet and docile); it requires several months of kind treatment and patience to break them in; they require to be gradually habituated to the yoke, and harsh treatment only makes them stubborn.'

Captain Davidson, in a report on the Amrat Mahal cattle attached to the Bombay column of the English Army in Afghanistan in 1842, says: 'No draught cattle in either army were so efficient as the 230 Mysore bullocks which accompanied the Bombay troops to Afghanistan. It was entirely due to the very superior description of cattle that no part of the Bombay Park was required to be abandoned when the troops were returning to India through the almost impassable roads through the Tirah Mountains. These cattle were frequently upwards of sixteen hours in yoke.' (Report on the Agricultural Department, Antigua, 1917-18).

DRAUGHT CAMELS.

Writing in the *Journal d'Agriculture Pratique*, Mr. F. Couston, Agricultural Engineer of the South Algerian Territories, gives some interesting particulars of the use of the camel in the Algerian Sahara as a draught animal. It is little used as such, he says, but this is a mistake, as it is fairly intelligent and can be well broken in. Were it used for draught purposes, many agricultural works could be carried out that would greatly increase soil productivity in many regions of South Algeria where horses and mules are few and costly, or even absent. If the camel were harnessed to the plough, vast regions still uncultivated could be made productive, and thousands of acres could be sown down to wheat.

Camels are little used for ploughing in Algeria, while the practice is quite common in Tunis. Thus the Sfaxiens plough their immense olive groves with camels, turning round and round the trees, which shows the animal can be well broken in. In Tunis camels are harnessed to a small cart with two high wheels called 'araba', and used for most of the carting. Mowers, reapers, binders, and cultivators, can be drawn by camels, either singly or in pairs. This has been shown at the Agricultural Experiment Institute at Tripoli, where barley was harvested with a harvester drawn by two camels harnessed abreast.

The camel can also be harnessed to machines for raising water, as is done in Mzab. Breaking in the draught camel is, according to Lieutenant Bel, 'not difficult, as the camel is rather timid than obstinate; brutal treatment must be avoided if quick results are wanted; the voice, a movement made with a stick or whip, mostly suffice to urge them on. As with the horse, the camel must be accustomed to walking with complete harness before it is put to draw, care being taken that the men pull gradually on the swingle-trees, while as many camels as possible should be placed abreast.'

The author records a very successful ploughing match with camels at Biskra, in February 1918, when seventy competitors took part. It would be interesting, at the annual competitions for distributing prizes to camel breeders, to include a class for draught camels, together with suitable tests. (*Journal of the Royal Society of Arts*, July 25, 1919.)

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*
**Seconded for Military Service.*

Agricultural News

VOL. XVIII. SATURDAY, SEPTEMBER 20, 1919. No. 454.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue gives various instances of the way in which harm may accrue from the dissemination of wrong theories.

An interesting article, illustrated, on the fisherman-fish appears on page 293.

A first-hand report on a recent tractor demonstration in Barbados will be found on page 301.

Insect Notes in this issue comprise two articles, one on the food of Tiphia and Campsomeris, the second on insects attracted by smoke.

Developing British Guiana.

Speeches made in London at a Royal Colonial Institute luncheon given in honour of the Demerara delegates on August 13 last, are reported in a recent issue of *The Times*.

The statements made were chiefly repetitions of well-known facts, the outstanding one being that British Guiana requires labour. There is little in the speeches to indicate that practical work is being done to solve the problem. As reported in *The Times*, it would appear to the English reader that British Guiana requires European settlers; whereas the real requirement is native labour capable of doing field work on the estates, and capable of opening up and settling in the interior.

The possibility of obtaining labour from India seems remote. It will therefore be necessary to consider possibilities farther east, in China and Japan, and in Africa, where there is a surplus that might be attracted to British Guiana, if a scheme could be invented satisfactory both to the emigrants and the Colony.

Nitrogen Fixation in Tropical Soils.

The need for further investigation into the causes of variation in the rate of nitrogen fixation in Indian soils is called attention to by Mr. C. M. Hutchinson, B.A., Imperial Agricultural Bacteriologist, Pusa, in the *Agricultural Journal of India*, Vol. XIV, Part 2. He says: 'Observations made at Pusa of the rate of fixations of nitrogen both in field soils and in the laboratory, have confirmed my opinion that not only is the amount of nitrogen taken from the air and added to the soil by azotobacter of considerable economic importance, but that this amount may vary within such wide limits that it seems highly probable that, were we in possession of more accurate information as to the causes of such variation, we should be able to increase this amount very considerably, quite possibly by mere soil management such as is made use of to secure nitrification, or possibly the addition of some stimulating substance which may be absent in some soils.'

One important factor in the fixation of nitrogen in soils is probably the continuous and concurrent removal of the products of the bacterial action involved in the process of fixation. Another, is the provision of carbohydrates to supply the bacteria with the necessary energy. But we have only to suppose a symbiotic relationship between azotobacter, which is the chief nitrogen-fixing bacterium, and green algae, to see how the process can proceed, limited only by the necessary soil moisture, and the presence of such inorganic salts as are requisite for the growth of these organisms.

The practical value of fully understanding the process of nitrogen fixation is demonstrated by the fact of its importance. In certain Punjab soils, nitrogen fixation leads to the addition of as much as 30 per cent. to the nitrogen content of the soil during the year.

Canadian Trade Prosperity.

The following figures, showing the trade between Canada and the British West Indies and British Guiana for 1916-18, are likely to prove of interest. The fiscal year in each case ends on March 31 :—

	Imports into Canada from West Indies.	Exports from Canada to West Indies.
1916	$6,257,963	$4,115,872
1917	14,239,005	5,163,278
1918	10,550,550	6,838,563

The figures for British Guiana are even more striking :—

	Imports into Canada from British Guiana.	Exports from Canada to British Guiana.
1916	$5,636,630	$1,207,134
1917	7,197,893	1,631,395
1918	8,824,288	6,716,647

During 1913-19 the total trade of Canada with the world was more than doubled ; it rose from $1,047,157,421 in 1913 to $2,169,523,502 in 1919.

During 1913-19 Canada's total trade with the United Kingdom was also doubled, practically speaking, rising from $308,903,639 to $604,950,192. The increase was in exports, which were more than trebled; imports from the United Kingdom dropped from $138,741,736 to $73,029,215.

Canada's trade with the United States underwent a remarkable expansion during this period. Last year her trade with the Republic was equal to 55 per cent. of the total with all countries. The exports were more than trebled while imports from that country were increased by 75 per cent.

The True Mahoganies.

The establishment in recent years, of mahogany plantations in certain places like Trinidad, makes it desirable to know the exact botanical source of the different kinds of trees.

Mr. R. A. Rolfe, writing in the *Kew Bulletin of Miscellaneous Information*, (No. 4, 1919), enumerates three species : *Swietenia Mahagoni*, *S. humilis*, and *S. macrophylla*. The first-named species is the West Indian mahogany; *S. humilis* is the Pacific coast mahogany, possibly the same as Nicaragua mahogany ; while *S. macrophylla* is the British Honduras mahogany. This last-named tree has larger leaves and still larger leaflets than *S. Mahagoni*, and grows very much more rapidly.

Mr. Rolfe concludes his article with the following remarks : ' It would be interesting to identify the trees which produce the different Central American mahoganies, for example, Costa Rica, Nicaragua, Guatemala, and Panama mahogany, and for this, flowering and fruiting specimens are desired. The term mahogany is now applied to the timber of so many trees that nothing short of the actual materials will serve to identify them. All the timber named, may not belong to the genus Swietenia.'

It would also be useful to obtain and compare the commercial or economic characteristics of these different mahoganies.

The Jamaica Imperial Association.

The acting general Secretary of the Council of this body has forwarded a copy of the minutes of a council meeting held on August 20 last.

The matters discussed were of a varied and comprehensive character, and indicate the wide range of interest taken by this Association in Jamaica and Imperial affairs. The subjects brought up included shipping, railway freights, penkeeping, the leather trade, lands in Africa and other matters.

A resolution was unanimously passed in favour of the maintenance of the Imperial Department of Agriculture for the West Indies on a liberal scale in view of 'the vital importance of encouraging the growth of agriculture in the West Indies on scientific lines.'

Rubber Research in Malaya.

Prof. J. B. Farmer, D.Sc., F.R.S., who takes deep interest in all matters affecting the rubber industry generally, contributes to the *India-Rubber Journal* for July 26, 1919, an interesting article in which is briefly discussed the official memorandum presented to the Government of the Federated Malay States, by Dr. Butler, Imperial Mycologist of the Department of Agriculture in India, on the problem of the organization of rubber research in Malaya. The immense importance, financial and otherwise, of the great rubber plantation industry in Malaya, is recognized everywhere in circles interested in the development of the resources of the Empire, and the future of the industry, Professor Farmer states, is intimately bound up with a corresponding advance in knowledge, which can only be obtained through scientific research; and he suggests, as absolutely sound, the broad idea that the country will benefit by the pooling of all scientific information. It is short-sighted policy, he argues, to endeavour to work in secret or apart, however much an owner or a company may seem to profit for a while by the possession of exclusive information; hence the necessity for co-ordination is emphasized.

The proposed establishment of a Rubber Board, which is to be assisted by a Technical Committee formed from the scientific staff transferred from present scattered sources, to effect the object in view, is criticised by Professor Farmer, in so far as the financing of the scheme is concerned. Broadly, it works out that the Government is to find the money for capital expenditure, while the industry (by means of special taxation) is to provide for the recurring expenditure. The difficulties in carrying out the scheme, and especially in giving direct representation on the Board to the scientific staff, are pointed out, and some sort of contact with external scientific opinion on the part of those who have to direct the course of rubber research and investigation, it is suggested, seems inevitable if the scheme as a whole is to prove a real success, and is to promote the advance of the industry in the most effective way possible.

INSECT NOTES.

FOOD OF TIPHIA AND CAMPSOMERIS.

Soil grubs similar to the brown hardback grubs which occur as pests in the West Indies are the cause of much loss to planters in Queensland. In the *Queensland Agricultural Journal* for July 1919, there appeared interesting notes on the subject of cane grub investigations, by Dr. J. F. Illingworth, Entomologist on the staff of the Bureau of Sugar Experiment Stations.

Referring to the importance of nectar-producing plants in cane areas, the author mentions the flower-visiting habits of the parasitic wasps of the genus Campsomeris, which attack grubs of several kinds. In the West Indies, Campsomeris is the parasite of the ordinary or black hardback, and it is one of the most frequent of flower visitors in those districts where it is abundant. On the other hand, *Tiphia parallela* the parasite of the brown hardback, is not a flower visitor. In Barbados it feeds on the sweetish secretions of aphides. In St. Kitts it has been observed on the flower-buds of the Horse bean (*Canavalia ensiformis*), where its actions indicated that it was feeding.

In recent attempts to introduce Tiphia into Mauritius, it was found that the success of the final attempt was achieved only because of an abundance of the plant *Cordia interrupta*, which develops vesicular hairs containing nectar. Dr. Illingworth refers in his notes to Tiphia in Mauritius feeding on the flowers of *Cordia interrupta*, and includes this insect among those which would benefit by an increase of nectar-producing plants in cane areas. That author suggests planting Pigeon pea (*Cajanus indicus*), and the Bonavist (*Dolichos Lablab*) along borders of cane fields in order that the nectar from their flowers might serve as food for parasitic wasps.

In Barbados, *Cordia interrupta* is being grown for this purpose, and it is particularly useful because it produces nectar, not in flowers, but in its vesicular hairs. There are possibly other plants which, like this and the Horse bean, furnish food for adult Tiphias which though depending on sweetish, nectar-like substances for food, do not care to visit flowers to get it.

In districts where the brown hardback grubs are troublesome as pests of sugar-cane and maize, it may be possible to increase the number of parasites by providing the adults with abundant supplies of food. This should help to attract them to the districts where grubs are abundant, and also assure them plentiful supplies of food during the period of mating and egg-laying

Throughout the West Indies it has long been a practice to grow pigeon peas on the headrows along the borders of cane fields, and the bonavist is also of frequent occurrence. Under Barbados conditions where wild flowering plants are not abundant, it may be that these have been useful in furnishing food to the parasites of the hardback grubs. It should be remembered, however, that while nectar-producing flowers would be valuable in providing food for parasitic wasps of the genus Campsomeris, it is necessary to find extra-floral nectar for insects of the genus Tiphia as supplied by the vesicular hairs of Cordia and similar material produced by other plants, or similar sweetish substances such as the honeydew produced by aphides and other plant-sucking insects.

H.A.B.

INSECTS ATTRACTED BY SMOKE.

In the *Canadian Entomologist*, May 1919, an article appears on popular and practical entomology entitled, 'Fragments in the Life Habits of Manitoba Insects'. In this the author, Mr. Norman Criddle, of the Dominion Entomological Laboratory, Treesbank, Manitoba, gives some very interesting notes.

An account is given of the means found useful for attracting a very handsome day flying moth Most of the larger moths are night fliers, and many of them can be attracted to lights. With day-flying moths, however, light-traps are of no avail. It was found in the case of the buck moth (*Hemileuca lucina*, var. *latifasciata*, B. and Mc. D.) that smoke provided the necessary attraction. A small fire was built of dead grass and leaves making a smudge which would send its smoke down wind for ½-mile or so. The moths were soon seen beating up wind, making directly for the fire, i.e., the source of the smoke. It was noted, however, that only male moths were attracted by the smoke.

Another portion of the article deals with the house-fly and gives an account of the attraction of the smoke for this insect. The following is quoted : 'Our first experience with the house fly as attracted to camp-fires was many years ago. We thought then that it was the savoury smell of a roasting grouse that induced the gathering, and I am not prepared to say even now that this was not, in part, the case. Later, however, we discovered that the flies came almost, if not quite as readily, when no cooking was in progress. But the climax was reached when we attempted to drive the pest from a building by smoking it out, and after being forced out ourselves and permitting the smudge to modify, found to our astonishment that the flies were thicker than ever inside, as if waiting a promised feast. It seemed to matter little where the fire was started, be it in the wilds far from habitations, or close round the farm yard, the smoke no sooner had time to spread than along came a house-fly, and soon a small procession was seen rapidly beating "up wind."

'Unlike the moth described above, the flies did not fly directly into the fire, but instead, seemed to use the smoke merely as a guide that led to objects more attractive. Further observations convinced us that smoke constituted an invariable attractant for these insects. We also noted that a frequent method of entering a house, namely, by means of a chimney, was only utilized when a fire provided the necessary smoke, and not to any noticeable extent when heat alone issued forth.

'Thus the contention that the attraction was in reality heat and not smoke, does not seem to be warranted from this evidence, and while the gathering of flies around screen doors and windows is doubtless, in part, due to warmth, it may also be largely influenced by the smells from within, including smoke. Our experiments in the field, in which we provided a maximum quantity of smoke with a minimum amount of heat, in every way confirmed our previous observations as to smoke being the true cause of the attraction. It might be asked why should flies be drawn to smoke and follow it to its source? What does smoke usually foretell? A habitation or camp fire, and these in their turn, man and food. Is it not possible that this reasoning acquired from long association with mankind, has become part of the fly's instinctive nature? It seems so to me, but I am content to let others judge. In any case, there are opportunities for some interesting experiments along the lines of this study which would seem well worth while.'

H.A.B.

THE INDUSTRIAL DEVELOPMENT OF HAWAII.

Two important articles have recently appeared on the industries of the Hawaiian Islands. One is an article entitled, 'Some of the Factors in Industrial Development of the Hawaiian Islands', by Mr. J. N. S. Williams, M.I.Mech. E., which appears in the *Journal of the Royal Society of Arts* for July 25, 1919. The second article, of a less economic character, is entitled, 'Observations on Agriculture in Hawaii,' by Mr. P. J. Webster, published in the *Philippine Agricultural Review*, Vol. XII, No. 1, 1919.

The Hawaiian Islands contain an area of about 6,500 square miles and a population comprised of different races of about 250,000. The principal industry is the production of sugar, and some interesting and instructive facts are recorded by Mr. Williams in regard to this industry's development. The main factors which caused the sugar industry of Hawaii to rise to its present eminence were as follows: Firstly, it was due to the advantages afforded to the Hawaiian planters by the admission of their products by treaty free of duty into the American market, whereby the sugars brought enhanced prices by reason of the duty levied on all other sugars entering United States ports from foreign countries. Secondly, it was due to the highly developed system of co-operation amongst the Hawaiian planters themselves, which extended from the supplying of labour for tilling the lands, to an advisory oversight as to cultural and manufacturing operations, and to the marketing of the finished product

By co-operation the planters were able to obtain labour from nearly every country in the world; but a very large proportion were Japanese, who are industrious, thrifty, energetic, and ambitious. This raises the question as to whether the labour scarcity in British Guiana and Fiji might not be remedied by means of Chinese or Japanese emigration. If this has proved successful in the Hawaiian Islands which have a similar climate, and general conditions, there would appear to be no definite reason why the experiment should not be tried in other territories.

Interesting statements are made in Mr. Willams's article concerning the out-turn of sugar per labourer employed. In 1882 the output of sugar amounted to 7 tons per annum per man employed on the plantations; in 1890 this production remained about the same; in 1900 this ratio had increased to about 9½ tons per annum per man employed; and in 1917 the output of sugar per annum per man employed on the plantations had about doubled that of 1882, since in 1917 each man employed produced about 14 tons of sugar. This was due to the efficient carrying out by the Association of Sugar Planters of the charge laid upon it at the inception of the enterprise, of 'securing such improvement in the cultivation of sugar cane and in the manufacture of sugar as may seem to be desirable.'

Although sugar is by far the predominant industry of Hawaii, cattle and pine-apples are also of considerable importance. Fresh milk and cream of good quality are obtainable at all times. The value of fruits and nuts exported, chiefly pine-apples, in 1917 was $8,355,395. The value of the sugar exported during the same year was $63,133 274. Situated in the Islands are a number of large pine-apple canneries, and the export of the fruit in a canned condition is the principal trade. Large quantities of coffee are also produced in Hawaii, and not inconsiderable quantities of rice and honey.

One interesting feature of the sugar-cane cultivation deserves mention before concluding this article, namely, the use on Hawaiian sugar estates of paper mulches. This new method of conserving the moisture in the soil by putting down paper manufactured from megass has been looked upon with some scepticism in certain quarters. But it has given good results in the drier districts, and in the future we may see it adopted by some of the more enterprising planters in the West Indies.

DEPOSIT SYSTEM FOR CREDIT SOCIETIES.

Reference was made in the *Agricultural News* of August 9, 1919, to the successful establishment of six agricultural credit societies in Tobago. The following extract from the *Port-of-Spain Gazette* (Trinidad) shows that these societies possess a new feature:—

A noteworthy feature in the working of the societies is that they not only aim at lending money to members to assist in improving their cultivations, but recently they have launched out into the idea of further encouraging the spirit of thrift by starting a system of saving deposits. An individual depositor can place a maximum of $50 by way of saving on which he gets 4 or 5 per cent., and at the end of a year he has the option of transferring it as a loan to the Society at 7 or 8 per cent. The following figures show the interest that is being taken in the deposit system. The Scarborough Society for the year has a saving deposit account of $144, Moriah $135, Pembroke $148, Delaford $329. and Mason Hall (which has just started) $822. The Societies, on the whole, have operated well during the year, and after paying expenses have made a profit on their working. In this connexion the Scarborough Society shows a profit of $19·73, Moriah $34·93, Mason Hall, $56·38, Pembroke $26·96, and Delaford $68·46. Part of the profits go to the reserve fund which is being built up, and in addition to profits, Scarborough boasts a reserve of $71, Moriah $61·50, Mason Hall $56, Pembroke $42·29, and Delaford $62·50, The reserve fund, it may be mentioned, is never utilized for the purpose of loan.

Recent Jamaica Exports.—The following figures, supplied by *The Times* Jamaica correspondent, show the exports from that colony for the first half of this year, and the corresponding period of 1918 :—

Article.	First half of 1918.	First half of 1919.
Coffee (cwt.)	35,767	352,859
Co-co-nuts	8,855,750	11,831,858
Cacao (cwt.)	32,216	50,066
Dyewoods (tons) ...	12,877	36,899
Bananas (bunches) ...	394,795	4,288,102
Grape fruit (cases) ...	6,935	10,536
Pimento (cwt.)	30,176	32 563
Rum (gallons)	146,843	1,844,739
Sugar (tons)	14,581	20,999
Cigars (lb.)	76,206	115,939

A large increase in the case of every item will be noticed. The wholesale price of bananas in London is now about 1*s*. a dozen, but the retail price is nearer 6*s*. a dozen. This profiteering in the banana trade, is, according to *The Daily Chronicle*, causing a big outcry amongst consumers.

GLEANINGS.

It is stated in the St. Croix *Avis* that a singularly large turtle was caught at estate Cane Bay a few weeks ago, which weighed 307 lb.

According to the St. Croix *Avis*, Porto Rico will shortly have one of the most powerful wireless stations in the world. The plant consists of three steel towers, 865 feet in height, situated at an altitude of 1,100 feet above sea-level, operated by two Deissel engines of 200 Watts each.

It is stated in the *Experiment Station Record*, Vol. 40, No. 6, that a veterinary writer discussing the distribution and functions of vitamines, points out that they constitute a factor which must be considered in animal as well as in human nutrition. This fact has, up to the present, not been sufficiently emphasized.

The sugar beet acreage for the season of 1919-20 in the United States is the largest on record, according to *Facts about Sugar* for June 28, 1919. The area planted is approximately 879,500 acres. This is an increase over last year of 23·6 per cent. Present conditons promise a fair average production which will result in 865,000 tons of sugar.

A new decolorising carbon is referred to in the *Experiment Station Record*, Vol. 40, No. 6. This carbon which has been patented in most sugar countries, is made by treating a mixture of molasses and kieselguhr with sulphuric acid, baking in suitable containers until the reaction is complete, and then washing the resulting carbon free from acid.

According to an important report on the trade of Fiji, reproduced in *The Board of Trade Journal* for June 26, 1919, the whole future of Fiji depends on the solution of the labour question. In this respect the position of Fiji is similar to that of Britith Guiana and other colonies. Direct shipping facilities between Fiji and the United Kingdom are strongly advocated.

The report of the Acting Protector of Immigrants, (Trinidad) for 1918, states there were no arrivals and no departures during the year. As a result of the high cost of living there was a large decrease in the amount of remittances to India, and of deposits in the Savings Bank. In 1917 the remittances to India amounted to approximately £4,500, and the bank deposits to approximately £67,600. In 1918 the sum of £1,494 was remitted to India, and £57,777 deposited in the Savings Bank.

The value of velvet bean and palm kernel meal as food for dairy cows is dealt with in the *Experiment Station Record*, Vol. 40, No. 6. It is stated that although the palm kernel meal did not prove very palatable, a mixture of either velvet bean or palm kernel meal with corn meal proved satisfactory for milk production.

A quarterly report of the Trinidad Ankylostomiasis Commission for the period ended June 30, 1919, has been received. This deals with work achieved in the Cunupia area. Out of the 94·8 per cent. of people treated 76·6 per cent. were cured. The improvement in the habits of the people is noticeable, and it is hoped that this improvement will not be allowed to die out.

The collapse, recently, of a mate in the hold of a schooner at Barbados containing molasses, indicates that some attention should be given to the present method of clarifying this product. From the fact that the white paint of this vessel was discoloured, and silver coins turned black, it would seem that considerable quantities of sulphurous if not sulphuric acid had been added to the molasses before it was shipped.

A note appears in the *Experiment Station Record* for March 1919, on the importance of mold action in the soil. Cultivated soils contain a much smaller number of molds than they do bacteria and actinomycetes. Molds live and produce mycelium in the soil, and therefore take an active part in the transformation of many organic and inorganic substances. Molds present in the soil, at least most of them, do not fix any atmospheric nitrogen.

The digger pine referred to in the *Journal of the New York Botanical Garden* for June 1919, is a native Western California, on dry foot-hills from 500 to 400 feet elevation; it is most abundant, however, and attains its greatest size on the sun-baked slopes in the middle of the State. The Indians of California found in its sweet seed a valuable article of food. The plant's botanical name is *Pinus Sabiniana*.

The exports of agricultural produce during January to August 1919 from Dominica were much greater than during the same period for 1918. For instance, during the 1918 period only 34,062 coco-nuts were shipped, whereas this year 237,034 nuts were exported. Similarly during the 1918 period 6,075 barrels of fresh limes were shipped, whereas for the half-yearly period of 1919, 18,143 barrels were exported.

The results of the 1917-19 (English) course at the Peradeniya School of Tropical Agriculture, Ceylon, appear to have been satisfactory, according to a report in the *Tropical Agriculturist* for June 1919. Of the twenty-six students who completed the course, twenty-two were awarded full certificates, two certificates excluding estate accounts, and one a partial certificate. Two gold medals and ten prizes of books were offered for competition by leading Ceylonese agriculturists.

MECHANICAL TILLAGE.

TRACTOR DEMONSTRATION IN BARBADOS.

A well-attended demonstration of the work done by the Twin City Tractor took place at Bush Hall and Waterford estates on September 9, 1919. Amongst those present were H. E. The Governor of Barbados, the Director of the Local Department of Agriculture, and members of the staff of the Imperial Department of Agriculture for the West Indies, together with many of the leading planters.

The first part of the demonstration consisted of ploughing partially-prepared land. Attached to the tractor was a three-furrow mould-board plough. This was successfully drawn by the tractor, ploughing to a depth of 8 inches. The speed of the tractor was about 4 m.p.h. While this demonstration proved that the tractor is capable of doing that class of work described, it would have been of greater interest if a subsoil plough had been used instead of a mould board plough, for deep ploughing is the kind practised on sugar-cane estates in the West Indies. Nevertheless, since the resistance of a mould-board plough is greater than that of a subsoil plough, there is no reason to believe that the work with a subsoil plough would be any less satisfactory.

It is understood that the makers of the tractor are arranging to construct and send to Barbados a suitable plough at an early date.

The second part of the demonstration was of a more strenuous character. In this the tractor was required to haul the plough through soil containing old cane stools, land that, except for the removal of trash, had not been touched since the crop was harvested. The condition of the soil was not very favourable for ploughing by tractor, being wet and soft. Nor was the surface of the field at all ideal for this work. Yet it must be admitted that, on the whole, the tractor did good work. It is true, frequent stoppages occurred, but these were not due to any faulty construction of the engine, but to the drains running across the field, and to the soft character of the soil which caused the driving wheels to slip.

This slipping of the driving wheels would seem to need attention. It generally tends to occur when one wheel is in the freshly cut furrow and the other is on the unploughed land. Naturally in this condition of list, greater weight is thrown on the furrow driving wheel, and a corresponding weight is taken off the land wheel. This not only means a loss of power through the land wheel slipping, but also means that a strain is put on the differential. On harder soil it probably would not have occurred; but some arrangement of adjusting the height of the axle on the lower side, an arrangement which, it is believed, has been successfully adopted in some makes of tractors, would greatly reduce the trouble referred to.

As already intimated, there are no objections, as far as this demonstration went, to the Twin City engine. Some people were inclined to think that the tractor as a whole was too heavy, but the efficiency of the engine was beyond dispute. It started easily on gasolene and worked on kerosene in a highly satisfactory manner. It would appear that the governing arrangement in this engine is good, for the speed remains constant irrespective of the great and continual alterations in load. The engine is fitted with a Bosche magneto, and the four cylinders are cooled by water circulated by means of a pump. The engine is claimed to develop 35 h.p.

The capacity of this tractor for haulage work on the road was not demonstrated, but it may be taken for granted that it would be quite satisfactory. Ordinary motor vans are being used for haulage in Barbados: it is likely that a tractor of the Twin City type would be found more economical and less liable to accident.

The makers claim that the Twin City will plough 8 to 10 acres a day on a consumption of 20 gallons of kerosene. This is interesting in comparison with figures from Antigua in regard to the Titan tractor there. The power of this tractor at the draw-bar is 10 h.p. It will plough 3 acres a day on a consumption of 16 gallons of kerosene; but this might be improved on under skilled management. Its cost is about £400; that of the Twin City tractor is about £500. It would appear therefore that the Twin City is the better investment.

What we really need in the West Indies is a ploughing match with different tractors. In Barbados we have a Fordson, a Cleveland (caterpillar), and Twin City. If these were tried against each other doing actual work on an estate, the planter could soon make up his mind as to what he is prepared to buy. As it is, we hear one person saying this tractor is the best and another person saying that one is the best, while in reality no one knows which is the best until they have been tried under exactly the same conditions. There used to be ploughing matches in Barbados with oxen. This custom has of late years disappeared. If it were revived in regard to tractors, as it could be by a live agricultural society, we should ascertain information that would benefit the planter, and provide the makers of tractors with a sound idea of what West Indian estates are really in need of.

MOTOR TRACTORS FOR ST. VINCENT.

The Barbados *Standard* for August 24 published the following report on the proceedings of the Legislative Council, St. Vincent:—

'Replying to the question by Mr. Corea, notice of which was given at the previous meeting, His Honour stated that the Governor-in-Council had decided to allow motor tractors to be imported free of duty, with a view to encouraging the use of such machines in suitable areas, provided such tractors were to be used only for agricultural work.

'An Order-in-Council made under authority of the Customs Duties Ordinance, 1913, on the July 14, 1919, causing "Motor Tractors imported and used for Agricultural work" to be inserted in the list of exemptions in the second schedule of the Ordinance was laid on the table and received the approval of the Council. The vote was unanimous.

'In view of the obvious need of machinery for tillage, in order to expand cultivation and to further develop the agricultural resources of the colony we heartily accord our approval to the encouragement thus accorded large land owners If cannot be doubted that if all the large estate owners desired fully to cultivate their lands they could not do so at present owing to the shortage of labour, or at least of men who are willing to plough the fields by methods adopted in the past. Implemental tillage was long ago recommended by the Imperial Department of Agriculture as a solution of one of the difficult problems with which agriculturists are faced in St. Vincent, and we think that a more general effort to turn to modern methods of tillage will check the growing dislike for field labour among the class upon which the planters are solely dependent for the cultivation of their lands, and would in the long run be beneficial to all sections of the community.'

ANTIGUA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1917-18.

This report shows that activity was continued at the Botanic Station in regard to the production and distribution of planting material. Amongst the principal kinds of material sent out were cane plants (50,000), onion plants (144,250), sisal (25,405). The distribution of coco-nut plants, though showing a decrease, were sufficient to indicate a continuation of interest in this industry. In regard to plant importations, a note appears on Sudan grass. This appears to have in Antigua the same drought-resisting characters of Guinea corn to which it is closely allied. Though the grass may be useful for cutting, it would not appear on account of its habit to be of much value as a pasture grass

Under the heading of plot experiments, attention is given first to onions which now constitute an industry of considerable importance in Antigua. Experiments conducted have shown that the germinating power of onion seeds kept stored over lime was maintained. Varietal experiments with onions have indicated that the growing of onions other than those of the Bermuda strain is at least a risky undertaking. It has also been shown that onions may be grown during every month of the year provided there is a sufficient supply of moisture. The usual experiments were conducted with different varieties of provision crops.

In regard to progress in the chief industries, the yields of sugar-cane and cotton were below the average; nevertheless this was counterbalanced to some extent by the high prices that ruled for this product. In regard to the minor industries, reference may be made to the increased cultivation of sisal and of Indian corn. A note on sisal cultivation in Antigua appeared in a recent issue of the *Agricultural News*.

The different co-operative societies that exist in Antigua, carried on their usual activities. The Onion Growers' Association had a successful year, and the Cotton Growers' Association conferred great benefit upon the small growers in the matter of purchasing their produce.

The results of the sugar-cane experiments are but briefly referred to in this report; they are dealt with in detail in a special report to be issued shortly.

An interesting section comprises the reproduction of a review of the work of Gunthorpes and Basseterre (St. Kitts) Central Sugar Factories during 1917. In this it is stated that the character of the work in these factories has been well maintained, and indeed some advance has been made. Judging from Hawaiian standards, which are the highest in the world, it should be possible to effect still further improvements. In any case, in Antigua and St. Kitts high level of efficiency has been reached.

Considerable progress was made in regard to the Land Settlement Scheme which at its inception was regarded by the peasants with a considerable amount of suspicion. After the suspicion disappeared, the people were quick to take advantage of the opportunities conferred by the scheme, and at the time the report was written most of the good land had been taken up.

Matters indicative of enterprise were the introduction of tractors into Antigua, and also the establishment in the island of a silo. Both these subjects have been dealt with in detail already in the *Agricultural News*.

In conclusion, a perusal of this report will make it clear that the Antigua Department carries on useful work along many lines, and that one of the most effective lines of activity is the work of the various societies operating in regard to the purchase and distribution of plant produce. This includes not merely the co-operative societies, but also such establishments as the central sugar factories.

DISTURBING FACTORS IN MANURIAL EXPERIMENTS.

The following observations by Mr. Joseph Jones, Agricultural Superintendent, Dominica, on the disturbing factors encountered in cacao manurial experiments are interesting. In Trinidad the natural yield of cacao trees has been determined so that the effect of special treatment might be better understood. Mr Jones says:—

This question of natural yield of cacao trees is one that would require very careful examination in Dominica. As is well known, the climate of this island is only a second class one for the higher types of cacao, such as the Criollo variety. It is only the Calabash and hardy strains of the Forastero variety that succeed. The Criollo variety, and the best strains of the Forastero are more prone to disease than the former. Generally speaking, in cases of attacks by canker (*Phytophthora faberi*), many trees are usually abnormal bearers for the longer or shorter term of their diseased existence. Unless very carefully examined, it might follow that the natural yield in a number of cases might be affected by the abnormal bearing of a number of diseased and dying trees. It is possible, unless great care is exercised, that the so called 'natural yield' of cacao trees might lead to greater errors in manurial experiments than the general acceptance for plot purposes that all trees are average bearers. It will be seen that the prevalence of canker is likely to prove a disturbing element in all cacao experiments, both in regard to the determination of the natural yield, and again in the manurial experiments.

The presence of canker would also operate in another direction. In some circumstances, considerable numbers of full-grown, or nearly full-grown, pods are attacked and destroyed by it. In Dominica the proportion of pods so destroyed is always larger, in fact it may be said to be chiefly confined to varieties which yield high grade cacao. The accidental grouping of such kinds in a field devoted to plot experiments would introduce another disturbing element. It may of course be argued that, if canker of the trees produces abnormal bearing, especially in the Criollo variety, and if the same canker also destroys a large number of pods of the same kind, that one balances the other. Even if this could be proved to be near the truth, it would be difficult to accept such a solution in any well-regulated experiments. And there is another disease at work known as brown rot, which takes a toll of cacao pods, the attacks of which may be very unequally distributed in a plantation.

Another disturbing element in cacao experiments is the presence of rats. In spite of efforts to keep them down, they usually succeed in exacting a considerable toll. And

again, the attacks are often unequal, that is, the rodents may exhibit a preference for individual trees, or for groups of trees in certain parts of field. To some extent the losses under this head could be followed up by collecting the attacked pods and calculating the amount of beans lost. But it is doubtful if this is done in any of the experiments of the present day. The yields given are those of cacao actually collected and sold, and it would probably be unwise, to introduce any form of calculating crops in addition to the actual crop gathered.

During the progress of experiments, losses may also be due to pilfering, which is so common in the West Indies. It is clear that the plots which suffer most in this respect are those which are so situated as to offer opportunities with the least likelihood of detection.

Though the losses from various causes are common on estates throughout the West Indies, it is clear that the effect of a single cause might affect plot experiments, especially in the case of a single series, and that a possible collective effect would make this work very misleading.

Much might be done to control canker in plantations by spraying. Information on this matter may be found on referring to the spraying experiments in Trinidad, which show the heavy losses caused by canker, and their possible effect on plots. Also the variation in yield of seedling trees might be overcome to some extent by making experiments with budded or grafted cacao, that is, with a single variety instead of many varieties as at present. It is understood that this is being done on some scale in Trinidad.

COWPEA PRESERVATION.

Considerable difficulty is often experienced by local planters in keeping cowpeas and other beans for any length of time free from bean weevils, and during the past many lots of beans and peas kept in storerooms awaiting favourable weather for planting have been destroyed by these pests It is fairly well known that applications of carbon bisulphide will free grain from weevils, but there are several drawbacks to its being commonly used for this purpose. In the first place, carbon bisulphide is expensive; and in addition, there is an element of danger always present when it is handled, on account of its being highly inflammable. Its obnoxious odour also renders it unpopular.

Two lots of cowpeas were put up in open bottles. One lot was stored in air-slaked lime at the rate of 4 parts of peas to 1-1½ parts of lime by weight, and one was stored without lime. The experiment was commenced on January and was carried on for six months. Cowpeas which were untreated were attacked by weevils in four weeks time, and those put up with lime were quite free from weevil attacks in July, six months after storing. Germination tests were made in July, and the peas kept in lime gave 96 per cent. The untreated lot was badly damaged by weevils, and thrown away some considerable time before the experiment terminated.

From the above it will be seen that planters have a cheap and effective method of keeping cowpeas free from a pest which in the past has caused them a considerable amount of worry. Although cowpeas are specially mentioned in the above, it is possible that many other grains which are being kept for planting purposes can be preserved in a similar manner. (Report on the Agricultural Department, Antigua, 1917-18.)

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets, for the month of July :—

In reviewing the condition of the London produce markets for the month of July, it must be taken into consideration that July is one of the chief holiday months of the whole year, when London is supposed to be denuded of half its population. The present year, however, has been more or less in an abnormal condition from its beginning, and the advent of peace with its accompanying rejoicings has for the moment occupied the minds of the nation to the exclusion of other matters. Notwithstanding all this, Mincing Lane has been fairly busy both in the matter of supplies and purchasers, as the following notes will show. Added to this, the period under review covers five weeks instead of the usual four, the first auction being held on July 3 and the last on July 31.

GINGER.

At auction on July 10, common to good common Jamaica was disposed of at 90*s.* to 95*s.* per cwt., and medium to good 100*s.* to 110*s;* washed Cochin fetched 85*s.*, and wormy 60*s.* to 62*s.* 6*d.*; for African, 55*s.* was asked, and for Japanese 50*s.*

SARSAPARILLA.

At the beginning of the month sarsaparilla was in good supply, as follows : grey Jamaica 33 bales, of which 10 only were sold ; 2*s.* 9*d.* per ℔. being paid for fair. Of Lima-Jamaica 55 bales were offered and 13 sold, 2*s.* 2*d.* being paid for part mouldy. Of native Jamaica 58 bales were offered and 40 sold, good red fetching 1*s.* 8*d.* per ℔., red and yellow 1*s.* 1*d.* to 1*s.* 2*d.*, and dull grey and red mixed 1*s.*; 12 bales of Mexican were also offered but held at 2*s.* per ℔.

PIMENTO, MACE, KOLA, ARROWROOT, CASHEW NUTS, ANNATTO SEEDS, CASSIA FISTULA, LIME OIL, TAMARINDS, AND CITRIC ACID.

Pimento has been steady throughout the month at from 5½*d.* to 5¾*d.* Mace has also held a steady position at from 1*s.* 7*d.* to 1*s.* 8*d.* per ℔. for ordinary to fair Singapore, and 1*s.* 3*d.* for pickings. At auction on the 3rd of the month kola was in full supply, being represented by 150 packages, 110 of which found buyers, good sound Java halves selling at 7*d.* per ℔, and 50 bags of slightly dusty West African quarters at the same price. At the end of the month arrowroot was represented by several hundreds of barrels of manufacturing St. Vincent, which were disposed of at 6*d.* per ℔. At auction on the 3rd of the month 20 packages of cashew nuts were offered but failed to find a buyer. At the same auction, 8 packages of annatto seeds were brought forward with a similar result. Cassia Fistula was reported at the end of the month as being dearer, holders asking 170*s.* At auction on the 18th of the month 3 cases of fair West Indian lime oil, chiefly hand-pressed, were bought in at 14*s.* per ℔. Tamarinds have been slow of sale: at auction on the 3rd of the month 100 barrels of fair Barbados were offered and bought in at 55*s.*, and it was stated that for 70 barrels of dark squashy Barbados that had been offered, no bid was made.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, July 24.

BALATA—Venezuelan Block, no quotations ; West Indian Sheet, 3*s.* 11*d.*
BEESWAX—No quotations.
CACAO—Trinidad, no quotations; Grenada, no quotations.
COPRA—£60
HONEY—Jamaica, 92*s.* to 99*s.*
LIME JUICE—Raw, Quietly steady ; Concentrated, no quotations.
PIMENTO—5½*d.*
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD, June 24, 1919.

BAY OIL—13*s.* 6*d.* to 14*s.*
LIME OIL—Cheaper, at 4*s.* to 4*s.* 3*d.* for West Indian distilled, and 11*s.* 6*d.* to 12*s.* for hand-pressed.
ORANGE OIL—West Indian, 8*s.*

Barbados.—Messrs. T. S. GARRAWAY & Co., August 20.

ARROWROOT—$8·60 per 100 lb.
CACAO—$21·00 to $24·00 per 100 lb.
COCO-NUTS—$36·00 husked nuts.
HAY—$4·50 to $4·75 per 100 lb.
ONIONS—No quotations.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—No quotations
SUGAR—White Crystals—$8·00.

Trinidad.—Messrs. GORDON, GRANT & Co., July 4.

CACAO—Venezuelan, $26·00 ; Trinidad, $24·50.
COCO-NUT OIL—No quotations.
COFFEE—Venezuelan, 20c. per lb..
COPRA—$9·00 per 100 lb.
DHAL—$10·50.
ONIONS—$9·00 to $9·25 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English, $5·00 per 100 lb.
RICE—Yellow, $12·00; to $13·00 White, $12·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., July 30.

CACAO—Caracas, 26c. to 26½c.; Grenada, 25¼c. to 25½c.; Trinidad, 26c. to 26¼c.; Jamaica, 21½c.
COCO-NUTS—Jamaica selects, $75·00; Trinidad culls, $52·00 per M. $75·00
COFFEE—Jamaica, 24½c. to 27½c. per lb.
GINGER—18c. to 21c. per lb.
GOAT SKINS—Jamaica $1·90; Antigua and Barbados, $1·80; St. Thomas and St. Kitts, $1·80.
GRAPE FRUIT—Jamaica, $6·00 to $7·50.
LIMES—$6·00.
MACE—42c. per lb.
NUTMEGS—19½c.
ORANGES—$4·00 to $5·00.
PIMENTO—8¾c. per lb.
SUGAR—Centrifugals, 96°, 7·28c; Muscovados, 89°, 6·00c. Molasses, 89°, 5·715c. all duty paid.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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CONTENTS.

	PAGE.		PAGE.
Rats' Troublesome in Trinidad	315	Items of Local Interest ...	308
Cane Sugar Industry, The Rise and Progress of...	313	Market Reports	320
Cane *versus* Beet Sugar...	312	Milk Adulteration Penalties	309
Coco-nut Oil. Shipping in Bulk	309	Moon and Crops, The ...	309
Coir Fibre, Mechanical Properties of	311	Notes and Comments ...	312
Colonial Credit Societies, Position of	318	Pen Manure, New Facts concerning	307
Cotton, Community Production of	310	Physiology, Recent Work in	311
Cuba Association, A Big	306	Pine-apple Culture in Cuba	311
Cultivating, Value of	317	Port of Bridgetown ...	313
Demerara Lime Juice and Rice Factory	310	Rubber Seed Oil... ...	309
Gleanings...	316	St. Lucia Prize Holdings Competition, 1918-19...	319
Hevea Rubber Trees, Effect of Lightning on	309	Sponges from the British Virgin Islands... ...	313
Insect Notes :—		Sweet Potato Experiments	305
Control of the Onion Thrips	315	Trinidad Exports ...	315
Protection against Weevil in Corn	314	Venereal and Other Diseases	317
		Volcano, A Great, Model of	312
		Weather in St. Croix ...	317

Sweet Potato Experiments.

IN the West Indies, a large amount of work has been done with the object of introducing into general cultivation improved varieties or strains of sweet potato. The interest shown by growers—both large and small—in this work has not been as great as it deserves. In the West Indies, the sweet potato is the staple vegetable. The poorer classes are largely dependent upon it for their food supply. It is therefore, economically, a very important crop, quite as important, in an economic sense, as sugar-cane or cotton, even though these last-named crops yield at present greater financial profits.

In some islands like Barbados and Montserrat there is, or used to be, an export trade in sweet potatoes to neighbouring colonies. But the high price of sugar and cotton has tended to attract growers to the cultivation of these crops, with the result that the cultivation of provision crops has suffered.

One exception is to be noticed in the British Virgin Islands, where during the last few years an important expert trade in sweet potatoes has grown up, due to the increased demand for this vegetable in the neighbouring American islands.

In any case it is always desirable and indeed necessary for every island to produce a large proportion of its sweet potato requirements, and greater attention should be paid to what the Agricultural Departments have done, and are continuing to do, with the object of making sweet potato growing more profitable.

For many years plot experiments with different varieties or strains have been carried out in Antigua Montserrat, St. Kitts and Tortola. Some varieties like 'Spooner,' 'Red Bourbon', and 'Hen and Chickens' have given consistently good yields; others, of which 'Gent's Table' is an example, have given persistently poor yields. Others again, like 'Blue Bell', are noted for their drought-resisting capabilities, others for their quality as a food for the table.

The Experiment Stations have carried out a number of trials also, in regard to the raising of new varieties. This work has been largely carried on in Antigua. One of these new varieties, A.9, has given exceptionally good returns for two years. Tested against 'Hen and Chickens,' which has given consistently good results for fifteen years, A.9 gave about 3,000 lb. of tubers more per acre than the control variety. Such a result ought to be of the greatest interest to growers.

Another line of experimentation in Antigua has been the selection of cuttings from the largest individual plants. Four years' trials have shown that this selection cannot be relied upon to give increased yields; in other words, the results though negative are definite, and therefore valuable.

It is to be regretted, however, that the majority of growers take little interest in this accumulated information. To them all sweet potatoes are more or less the same.

This lack of interest is largely the result of inadequate education. Much could be done in the elementary and secondary schools by means of variety plots in school gardens to infuse interest in the subject. It should be possible also to give class instruction in the results contained in the Departmental Reports. The movement could be further assisted in a general way by the newspapers. These might issue from time to time articles calling public attention to what is being done at the local experiment stations.

While it should be appreciated that the Experiment Stations have carried out useful work, there are certain points in regard to it which call for criticism. In the first place there seems to be a considerable amount of uncertainty as to the exact identity of some varieties. We cannot be sure that plants of a variety referred to under the same name in two different islands are really identical. Planting material of known varieties might be labelled and distributed from *one centre* to the different islands for each season's experiments.

Again, it would be much easier to judge the respective merits of different varieties if the daily or weekly rainfall received during the growing period was recorded, along with the record of the yields obtained. This is very necessary if we wish to compare the same variety growing in different places. Cooking qualities should also be stated.

As far as possible, the size of all plots in sweet potato experiments should be made uniform in size and equal in number. In some reports the size of the plots and the dates of planting and reaping are omitted. These should always be inserted. A note on soil conditions and planting distance should be included as well.

The production of sweet potatoes might be stimulated if it were possible to carry out successful experiments on the matter of storage. As is well known, the sweet potato unlike the yam, will not keep for any length of time. It might be possible to select good keeping varieties, or it might be possible to discover a way of treating the tubers so as to prevent the deterioration that occurs in the ordinary way.

The central marketing of sweet potatoes is restricted by this difficulty of storage. If it could be overcome, it should be possible to establish in many places a concern similar to the Onion Growers' Association in Antigua. If this were achieved, the cultivation of the best varieties would be stimulated, for the depot, having to grade its produce, would in buying, differentiate between good and poor qualities.

SUGAR INDUSTRY.

A BIG CUBAN ASSOCIATION.

Cuba is already the chief controlling factor in the cane-sugar world. Her position is likely to become still stronger, if the following movement, reported in the *Louisiana Planter*, proves successful:—

With the idea of organizing an association which will include all elements directly or indirectly interested in cane growing and sugar-cane production in Cuba, which will give the necessary encouragement and aid to any and all movements to strengthen and make as independent as possible the sugar producers and cane growers of the island, and which will enable the Cuban producers, who supply more sugar than any other group in the world, to have the deciding voice in the control of the sugar market as is their right, a number of sugar producers met early in the week and drew up plans for an 'Asociacion de Hacendados y Colonos de Cuba' (Association of Sugar Producers and Cane Growers of Cuba).

The complete plans have been published in the local papers. Summarizing them, the association is to be composed of two classes of members. The first class is to include the sugar producers and cane growers, and the second, the administrators of the centrals, chemists, engineers, sugar brokers, sellers of sugar factory equipment, or agricultural equipment, and any others who may be directly or indirectly interested in the betterment of sugar production in Cuba.

The main office of the association is to be in Havana. The management will be under the control of twenty-five members, who are to be representatives of all producers and cane growers who are members of the association (and we

might add that it is to be hoped that this will include every sugar producer and cane grower of the island). The active board of directors is to consist of no more than seven members, and only residents of Havana will be able to serve. These seven members will be as representative as possible of the sugar producers and cane growers of the six provinces. Various other committees will be organized to look after the different affairs of the association, and this will include local committees at each central. The number serving upon these local committees will be dependent upon the number of colonos or cane growers who supply cane to the Central.

The work of the association will be divided into nine departments or branches. First, a department of agricultural affairs; second, a department of industrial affairs; third, a department of immigration; fourth, transportation; fifth, statistical department, national taxes and custom house or import taxes; sixth, section of arbitration; seventh, banking and warehousing section; eighth, moral and material interests; and ninth, the legal department.

The economic resources of the association will be of two classes. First, a fixed voluntary contribution of $120 a year, payable in advance; and second, a proportional obligatory quota of one cent for each 100 arrobas of cane. The payment of the voluntary contribution does not excuse the payment of the proportional quota, but only those members making the former can be elected to the directorate.

The second class of members, referred to above, must pay $12 a year.

When the directors deem it convenient, an association bank with a capital of $100,000,000 will be created. There will be 1,000,000 shares of $100 each issued, and only the members of the association may be stockholders. In buying stock, each producer will put up 20 cents for every bag of sugar he produces, and each colono will put up a like amount for every 250 arrobas of cane he sells to the factory. The object of the bank will be to lend money to the members of the association to finance them until such time as their sugar is sold. In this way, if the price offered is not suitable, the producers may hold out until higher ones may be obtained. The bank will also lend money for agricultural work and the building and upkeep of warehouses. No other business may be undertaken by this bank unless there is no need of its money by the members of the association for cane growing or sugar production.

The association will endeavour to have beneficial laws passed, to lower the cost of machinery, agricultural implements and supplies, freight rates, both land and water, and national taxes.

The department of arbitration will act in any disputes that many arise between sugar producers and cane growers such as up to date seem to have been inevitable relative to difference in weights of cane and payment for the same. In cases where one central tries to attract labour from another by offering higher wages, the arbitration committee will also act, as well as in disputes with the railroads or sellers of equipment and supplies to the sugar producers and cane growers. Promotion of immigration will also be included in the duties of the association.

Realizing that it is absolutely necessary to the success of the association to have all sugar producers and cane growers as members, a circular letter signed by most of the representative sugar concerns has been distributed, urging all growers to attend the preliminary meeting which was held on August 21, 1919.

It is learnt from a later issue of the *Louisiana Planter* that the association was successfully established on that date.

SOIL SCIENCE.

NEW FACTS CONCERNING PEN MANURE.

It is well known that crops are not immediately benefited by the application of pen manure. According to a paper in *Soil Science* (April 1919) the effect of pen manure is not only delayed, but may actually cause a decrease in the amount of available plant food in the soil to which it is applied. This decrease in plant food, according to the Californian experiments referred to in the article, goes on for about forty days after the application of the pen manure. At the end of this time when the manure has become well decomposed, it of course adds materially to the available plant food.

It is further stated that the liberation of large amounts of carbon dioxide in the soil by rotting manure does not always greatly influence the composition of the water extract of the soil. It has been the general belief that a large amount of carbonic acid increases the amount of available plant food, through its solvent action.

The article goes on to say that the water-holding capacity and porocity of soil are undoubtedly improved by manure, quite apart from increase in soluble plant food, but the latter is increased chiefly or solely by the amount added in the manure, and very little due to reactions set up by the manure in the soil.

In regard to loss of nitrogen due to the addition of manure, it is stated that if the soil is kept sufficiently open to the air, there should be no loss.

In another article in the same journal, the ammonia-fixing capacity of gypsum (calcium sulphate) in regard to pen manure is dealt with in considerable detail. From this it appears be to unquestionable that gypsum will prevent to a certain degree the loss of ammonia from a mixture containing volatile ammonium carbonate, and it is quite probable that the loss prevention is due to the formation of non-volatile ammonium sulphate by the double decomposition of ammonium carbonate and calcium sulphate; for no other means is thought to be possible under the conditions of the experiments described in the article under consideration

The ammonia-fixing capacity of gypsum is apparently dependent on temperature. The quantity of ammonia given off by the ammonium carbonate increases as the temperature rises, and the percentage of it held by the calcium sulphate decreases.

A treatment of 300 lb. of gypsum to a ton of pen manure would no doubt effect a pronounced ammonia fixation, if the water content were comparatively high. Whether subsequent reactions that probably take place in a manure heap would prevent its remaining fixed, and whether the practice of reinforcing manure with gypsum is economical, are questions which are not considered within the scope of the investigations described in the article under consideration.

Concerning the economical side, however, it may be stated that considerable deposits of gypsum exist in the West Indies, chiefly in St. Kitts, and from this point of view there should be little difficulty in the way of employing gypsum for the preservation of pen manure in estate practice. The chief question to decide is whether the fixation is sufficiently permanent to make the addition of gypsum worth while This point calls for further and early investigation.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. Mr. A. J. Brooks, Agricultural Superintendent, in his notes of interest for the month of August, records plant distribution as follows: limes, 200; coffee (robusta), 100; ornamental, 15; sugar-cane cuttings 36; rice seed 2lb.; vegetable seed, 71 packets. Work in the Botanic Gardens consisted in laying out and planting up a number of ornamental beds, removing large trees, cleaning drains, mowing, raising lawns, and repairing roads. There is promise of a good cacao crop generally, a heavy lime crop, and prospects of a good sugar crop. A visit to the island on August 18, by Mr. H. A. Ballou, Entomologist, is noted Mr. Ballou left St. Lucia on September 3. Meetings were held in connexion with Agricultural Credit Societies. The rainfall recorded at the Botanic Gardens, Castries, during the month totalled 13·05 inches; at the Agricultural and Botanic Station, Choiseul, the record was 16·34 inches.

DOMINICA. The Curator, Mr. Joseph Jones, states that during the month of August the crop reaped in the lime experiment station was 149½ barrels of ripe limes and 1 barrel of green limes, making a total for five months of 351 barrels of ripe limes and 123 barrels of green limes. Plant distribution during the month was as follows: limes, 6,300; cacao, 175; nutmegs, 19; vanilla, 600; grafted mangoes 5; miscellaneous, 3. In addition, 228 packets of vegetable seeds were sold. The local prices for ripe limes and lime products remained unchanged. Cured cacao is in demand locally at 18c. per lb. The rainfall for the month was 9·64 inches.

On the date of writing (September 2) the weather was very threatening, the barometer falling steadily up to 3 p.m., when it had reached 29·78. In the afternoon there was such a heavy downpour of rain that the streets in Roseau were well-nigh flooded. At the Botanic Gardens 2·76 inches of rain were recorded. The Roseau River overflowed its banks, and inundated River Street, to such an extent as to create a real menace to the inhabitants of that district. The roads in the country suffered much less damage than was generally anticipated. Some minor landslips have been reported, together with a more important one on the Corlet road.

MONTSERRAT. The reaping of cotton from the breeding plots on the Experiment Stations was continued during August. In the Botanic Gardens bay and lime seeds were sown, and bay seedlings planted out. A great deal of time was spent in watering to keep the plants alive. Three distillations of bay leaves were made, with an average yield of 15·3 oz. of oil per 100 lb. of leaves. Plant distribution included 1¼ lb. peas, 1 lb. Ajowan seed, and 4 decorative plants. In relation to staple crops, the acting Curator, Mr. A. Gallwey, states that good weather was experienced for the reaping of cotton. Up to the present very little stained cotton has been reaped. The severe dry weather has caused a terrible set-back to all crops. There has been a marked scarcity of cotton stainers in the island during this season. A severe outbreak of mealy-bugs, however, occurred on growing cotton plants at Trants estate. Mr. S. C. Harland, B.Sc., Assistant for Cotton Research, arrived in the island on August 16 for special duty in that direction. Visits were made to Trant's, Blake's Sweeny's, and Braids estates during the month. The rainfall at Grove Station for the month amounted to 2·28 inches, the total precipitation for the year being 29·01

ANTIGUA. In consequence of dry weather during August, much watering had to be done to keep the plants in beds and borders in the Botanic Gardens alive. Much of the labourers' time was occupied in preparing boxes for seeds and young seedling economic plants. In the Experiment Station, plots of Sudan grass and Kaffir corn were supplied during the month. In addition, ordinary routine work was carried out. The dry weather, Mr. Jackson states, has made a considerable difference in the appearance of the young cane crop which is suffering from want of rain in practically all parts of the island, excepting possibly the southern district. The cotton crop, on the whole, continues to look promising. During the month the reaping of the sugar crop was completed, the total amount of sugar made being 12,746 tons. In addition, 1,250 gallons of syrup equal to about 185 tons of muscovado sugar were made. As regards pests, Mr. Jackson states that slight attacks of cotton caterpillars were experienced in some districts during the month. Investigations in connexion with the hard back beetle were continued; also the work of destroying cotton stainer host plants. In connexion with the latter, 520 Mahoe trees, 32 silk-cotton and 6 wild cotton trees were destroyed During the month, 126 crates of onions were shipped for and on behalf of the Antigua Onion Growers' Association. Plant distribution for the month included 250 sisal plants and 16 palms. The rainfall was 1·65 inches; for the year 21·20 inches.

From notes forwarded in reference to the Government Estate, Barbuba, for the months of July and August, it is gathered that very dry weather prevailed, and cotton planted by the peasants had been a failure. The stock are all in a healthy condition.

ST. KITTS. Mr. F. R. Shepherd, Agricultural Superintendent, writes to say that owing to the dry weather during the past month, no planting of any kind could be done in the Experiment Stations. The chief work was the picking of cotton in the experiment plots which is now in full bearing and promises good returns. In the Botanic Gardens the usual routine work has been carried on, and watering was necessary. Syrup making still continues on some estates in the northern district where the crop has been delayed owing to want of packages The young cane crop and ratoons have made little progress during the month, but have not suffered to any extent from the dry weather; the prospects are still good. The cotton crop is being rapidly picked and the prospects of good returns seem favourable. The quality of the lint is good. Cotton worm made its appearance during the month but was quickly checked, and no damage done. A few cotton stainers were seen but have been destroyed Mr. S. C. Harland visited during the month in connexion with cotton research work, and much time was occupied in visiting fields of cotton in St. Kitts and Nevis. The selection of cotton plants and examination of lint have received much attention. The rainfall for the month was 1·71 inches; for the year to date, 28·83 inches.

NEVIS. According to notes received from Mr. W. I. Howell, Agricultural Instructor, the crops at the Experiment Station have nearly all turned out a failure on account of the dry weather The picking of cotton in the demonstration plots has commenced, but the returns will be very poor as the trees are small and suffered much during the dry weather. The cane crop throughout the island is very much in need of rain, so much so that many of the late supplies have died out. The cotton crop in the windward part of the island is doing fairly well compared with other parts, and picking has begun in the

earlier fields ; but the returns will not be very good as the crop suffered during the dry weather. In other parts of the island the condition is distressing ; the plants are barely alive, and making no progress. There is a great scarcity of ground provisions, and the yam crop is doing very badly. The rainfall for the month was 1·66 inches ; for the year to date, 17·57 inches.

RUBBER SEED OIL.

An interesting article on Para rubber seed oil appears in the *Agricultural Bulletin* of the Federated Malay States for March and April 1919.

With the present freight charges ($7 per bag of 130 lb.) it would not seem profitable to ship rubber seed from the Federated Malay States to England for oil extraction. Nevertheless the oil itself brought £50 a ton in 1918, and the residual meal £8 a ton. The oil is stated to be inferior to linseed oil for paint manufacture, but good enough to mix with linseed oil for this purpose. The oil is no good for soap making.

Machinery to deal with 1 ton of decorticated seed per hour, including chemical extraction plant, but excluding boiler and engine would cost at the present time about £11,800.

Before such an investment could be profitable, considerable reduction in freight charges would be necessary ; also a special use would have to be found for the oil. It is suggested that rubber oil might prove more useful for paint mixing in warm climates than linseed oil, which is said to dry too quickly under hot conditions.

The area under rubber cultivation in Malaya is, approximately, 1½ million acres, of which 1 million may be taken as European-owned or managed estates.

The yield of seed may be taken at about 400 per tree, and assuming 90 trees per acre, the yield per acre would amount to 306 lb. (1,000 seeds=8·5 lb.).

This gives a total yield of 130,000 tons of seed per annum, which, on a 20 per cent. oil basis, represents 26,000 tons of oil.

From an economic point of view it would be preferable to express or extract decorticated seed. The quantity of decorticated seed, on the basis of 55 per cent. kernel, would amount to 71,500 tons, which could be taken as yielding by expression 36 per cent. of oil, or as above, 26,000 tons, approximately.

Milk Adulteration Penalties.—Heavy penalties for milk adulteration have been enforced recently in Trinidad. According to the *Port-of-Spain Gazette*, Rebecca Trotman, an aged woman, was recently charged at the City Magistrate's Court by Detective Corporal Hinds, functionary under the Food and Drugs Ordinance, with selling milk adulterated 28 per cent. added water.

Defendant pleaded guilty, and on being asked by His Worship if she had anything to say, said that the cow had a calf and she placed water into the milk to prevent the mother 'going dry.'

His Worship after referring to the stupidity of that sort of superstition, fined defendant £14, and costs 10*s.* 8*d.*; in default two months' imprisonment with hard labour. The fine was paid.

The same officer prosecuted John Rawlins on September 18 for a similar offence. In this case milk had been adulterated with 19 per cent. water. His Worship fined defendant £9 10*s.* and costs 10*s.* 5*d.* or two months' hard labour.

The Moon and Crops.—In the *Experiment Station Record* for July 1911, p. 17, attention is given to the continuation of experiments that were conducted at that time in France, in order to find out if there is any truth in the popular supposition that the moon exercises an influence on the growth of plants. In the latest trials, planting at the time of the new moon gave the greatest yield in twenty-eight cases, planting in the first quarter in twenty-nine, planting at the time of the full moon in twenty-eight, and planting in the last quarter in twenty-seven. This shows that no material difference in the yield could be attributed to the influence of the moon.

The Effect of Lightning on Hevea Rubber Trees.—It is well known that rubber trees are killed by lightning in the tropics just as other trees are in northern countries. Dr. Rutgers has given an account of other effects of lightning. In some cases it appears that trees may begin to die back at the tips of the branches, thus suggesting the disease known by that name and due to a specific fungus. In other cases the branches of trees may be only withered. In some instances, strips of bark have been killed. He further records that trees affected by lightning are very liable to the attacks of borers, these evidently gaining an entrance through damaged bark, even though the latter may not be quite dead. Vertical lightning scars are also sometimes observed on trees which have been struck by lightning. In one or two cases the outer bark of trees affected by lightning has scaled off, this result being known on the East Coast of Sumatra as 'Scurf'; in such cases the trees are not killed. (The *India Rubber Journal*, July 19, 1919)

Shipping Coco-nut Oil in Bulk.—With reference to the difficulty connected with the shipping of coco-nut oil in bulk in tank steamers, due to the solidification of the oil in cooler climates, and the recommendation contained in the paper entitled 'Copra and Coco-nut Products,' published in the *Agricultural Bulletin* (Federated Malay States, Vol. VI, No. 12, November and December 1918,) that this difficulty could be overcome easily by the use of steam coils in or around the tanks, the following information received from Messrs. Harper & Co., Kuala Lumpur, on behalf of the Asiatic Petroleum Co., should be of interest. The letter states :—

'It will be of interest to your Department to learn that regular shipments of coco-nut oil in bulk have been made from Java to the Pacific Coast of America in the double bottoms of cargo steamers. As stated in the article in the *Agricultural Bulletin*, the difficulty of solidification in winter can easily be overcome by fitting steam coils, the installation of which, in double bottoms, presents no difficulty.'

One of the greatest difficulties in connexion with the export of the oil is therefore easily overcome. (From the *Agricultural Bulletin* of the Federated Malay States for March and April 1919.)

Weather statistics published in the *Leeward Islands Gazette*, for August 21, 1919, show that the mean maximum temperature at Antigua Botanic Gardens during the middle of August was 85° F., at St. Kitts it was 86° F.; at the Botanic Station, Montserrat, however, the mean maximum temperature was 92° F. This is not in accordance with the generally recognized idea that Montserrat is the coolest of the Leeward Islands.

COMMUNITY PRODUCTION OF COTTON.

Much of what is said in the following summary of *Bulletin No. 742*, Bureau of Plant Industry, United States Department of Agriculture, applies to what has been achieved in the principal cotton-growing islands of the West Indies, like St. Vincent and Montserrat :—

The history of the establishment of Egyptian cotton production in the Salt River Valley is believed to have more than a special or local interest, since it offers a good illustration of the numerous biological, agronomic, social, and economic difficulties encountered in developing a new agricultural industry, and furnishes suggestions as to how these complex and diversified problems may be successfully solved. That co-operation is the keynote of success has become very clear in the progress of the present enterprise. In this instance co-operation has been maintained along the following lines :—

(1) Co-operation among the investigators has brought to the solution of the special problem different equipments of technical training and knowledge and different points of view, while their collective judgment has been focussed upon matters of general policy. The cordial and effective co-operation of the administrative officers of the Department of Agriculture has also been an important factor in this connexion.

(2) Co-operation among the growers has made it possible to produce and market the crop economically, and to maintain the uniformity and high quality of the variety grown.

Shipping Cotton at Montserrat.

(3) Co-operation between the growers and the investitors has made it possible to put into effect without delay the most improved methods of production and marketing This co-operation has been maintained by personal contact, since, in addition to the field agents of the department who have worked constantly in the community, members of a Committee on South-western Cotton Culture have made frequent visits to the Salt River Valley. The attitude of the officers and members of the Growers' Association in their co-operation with the Department of Agriculture has been a most cordial and helpful character and has been a very important factor in the establishment of the industry.

(4) Co-operation with the cotton manufacturers on the part of both investigators and growers has also contributed largely to the development of the industry. Manufacturers have assisted most willingly and effectively in making spinning tests of the product from time to time, and in furnishing both the Department of Agriculture and to the Growers' Associations useful information concerning the cotton. This information has guided the growers to better methods of handling the product, and has given the investigators helpful suggestions in connexion with the breeding work. Some of the manufacturers interested in this type of cotton have visited the Salt River Valley in order to learn at first hand the condition and prospects of the industry, while representatives of the Growers' Association and of the department have been welcome visitors at mills where the cotton is being utilized.

The policy of the Department of Agriculture in encouraging the production of long-staple cotton on the community basis is beginning to be appreciated by manufacturers and buyers, many of whom now realize that in order to obtain year after year ample quantities of cotton of unchanging character, they must look to localities where the farmers are organized to grow only one kind of cotton to prevent deterioration of the type by seed selection, and to class and market their crop as a unit.

DEMERARA LIME JUICE AND RICE FACTORY.

The Report on the Government lime juice, rice and corn factory at Onderneeming for 1918-19 has recently come to hand. The factory is divided into three divisions dealing with limes, rice and corn meal respectively, and in the case of all three divisions the year under review has been a very satisfactory one. In regard to rice, the information given is particularly interesting.

On the Annual Estimates for 1918 a sum of $280 was provided for the purchase of a No. 7 Engelberg Rice Huller in connexion with the Onderneeming Lime Factory. This huller was purchased and installed by the end of March, and started work early in April 1918 It was urged at the time that such a mill would prove a boon to the small rice growers in the surrounding districts.

This has proved to be the case, small growers, principally East Indians, have taken full advantage of the mill, having their paddy turned into rice week by week, and disposing of it either to shopkeepers or selling at the different villages and estates' markets, thus obtaining full return for their labour.

Transactions during the year comprise the milling for growers of 3,517 bags of paddy, yielding 1,869 bags of rice in small quantities of a few bags for each man each week. For this work the growers paid $1,663·43. In addition to the above the factory purchased 1,009 bags of paddy, which yielded 596 bags of rice. This rice has been supplied to Government Institutions (including the Almshouse, Industrial School, Prisons and Suddie Hospital) at cheap rates, and the balance sold to local shopkeepers. The total output of the mill during the year has therefore been 2,465 bags of rice.

A statement of expenditure and revenue is attached, from which it will be seen that the gross reveuue of the mil

amounted to $3,166·06, from which must be deducted working expenses, $812·88, and a sum of $480 paid to Government for management and supervision, leaving as profit for the year $1,873·18.

We had a sum of $280 to purchase and erect a mill the landed cost of which was $210, extensions to shaft had to be made, belts to be obtained, and steaming and drying contrivances supplied. All this has been accomplished and paid for, and the mill after crediting Government with a sum of £100 for the services of the Superintendent of the Institution, the Chief Officer and the Clerk, has netted the handsome profit of $1,873.

RICE FACTORY ACCOUNT FOR PERIOD APRIL 1, 1918 TO MARCH 31, 1919.

Expenditure.		Receipts.	
To Purchase of paddy :— 1,009 bags, 129 lb.	$3,674·81	By Milling $3,517\frac{36}{140}$ bags paddy	$1,663·46
„ Management (paid Government)	480·00	„ Sale of $565\frac{93}{180}$ bags rice	4,844·36
„ Other expenses	812·88	„ Sale of 652 bags rice dust	64·90
	$4,967·69	„ Sale of 5 lb rice flour	·40
Balance as profit	1,873·18		$6,573·12
	$6,840·87	On hand :— $31\frac{1}{2}$ bags rice	267·75
			$6,840·87

MECHANICAL PROPERTIES OF COIR FIBRE.

In the last issue of the *Agricultural News* we published a note on coir machinery which included a reference to the manufacture of coco-nut-fibre rope. In this connexion the following summary of a paper in the *Philippine Journal of Science*, Vol. XIII, Sec. A No. 6, on coir and coir cordage, will be found of great interest. Many of the facts recorded are new and original, and show that coir rope is not worth producing :—

The data in the literature on the mechanical properties of coir are very deficient, and often have been misinterpreted.

Coco-nut fibre in the Philippines is extracted in small quantity, entirely by the retting and beating process.

The results show retted filaments to average 228 mm., and machine-cleaned filaments, 245 mm. in length. Most filaments taper and have elliptical cross-sections, the dimensions of which are given. The finest filaments have a circular cross section.

Tensile tests conducted on single filaments average 832 kilogrammes per square centimetre for the retted, and 1,208 kilogrammes per square centimetre for the machine-cleaned fibre. The difference in ultimate tensile strength is less marked when the fibres are fabricated into rope. The strength of coir filaments and coir cordage is very low, roughly, one-tenth that of single abaca filaments (Government Inspected Grades 'F' and 'G') ; the strength of coir rope is about one-fifth that of abaca rope of the same size.

Immersion in tap water for twenty-four hours decreases the strength of coir rope from 14 to 26 per cent., whereas there is little change in the strength of abaca rope. Long immersion of the coir in fresh water produces little further change, but additional impairment is produced by the action of salt-water and weather.

Coir cordage and coir filaments are characterized by great elongation, which in some cases attains 39 per cent. There is little difference between the ultimate elongation of the filaments and that of the rope, though in the latter it is slightly greater. Wetting increases elongation of coir rope about 3 per cent.

Abaca filaments (grades 'F' and 'G') give an average elongation of only 3·6 per cent., but the rope made from filaments of these grades give an elongation of from three to four times as much.

Coir has pronounced plastic properties and has no definite modulus of elasticity.

Due to the small elastic tensile resilience of coir, its 'shock-absorbing' power is relatively small, whereas abaca is a highly resilient fibre, and is eminently suited to absorb shock.

The coir industry in the Philippines should be developed in order to furnish a fibre for bristles, brushes, doormats, mattresses, cushions, ship fenders, etc.

PINE-APPLE CULTURE IN CUBA.

The pine-apple is grown for export in Cuba. It thrives best in a sandy loam, but it is frequently grown in heavy clay also. The main requirement is that the soil must be well drained, and where it is not naturally so the plants are usually set in ridges. It is propagated from slips, the small plants on the fruit stalks, or from suckers, the plants growing in the leaf-axils of the mother plant. These are set at distances varying from 12 × 12 inches to 24 × 24 inches, according to the variety of pine-apple.

The varieties usually cultivated are the Red Spanish, Smooth Cayenne, Sugar Loaf, and Porto Rico (Cabezona). The Red Spanish is nearly always planted for export, as it is hardy, and a good shipper. The Smooth Cayenne is not grown very extensively in the West Indies, but is grown somewhat under shade in Florida and Panama. It is a very large and fancy fruit, bringing a good price, but it is more difficult to grow than the Red Spanish. The Cabezona is grown especially in Porto Rico ; also in some of the British islands under the name of Bullhead. The Sugar Loaf is grown everywhere for home consumption. There are a number of other varieties grown in different localities, but most of them are of no commerical importance at present.

Great care must be used regarding the good flavour and the shipping qualities. (From the *Cuba Review*.)

Recent Work in Physiology.—Experiments receive attention in *Physiological Abstracts* for June 1919, which tend to establish the principle that insects inhabiting fermenting and decaying substrata of low protein content, like flies and maggots in manure and meat, usually feed upon the micro-organisms present and thus benefit by the power of the fungi to extract, absorb and synthesize many non-protein nitrogenous compound.

Another note in the same journal refers to the poisonous principle in the Tetrodon or Globe fish that occurs in West Indian waters. This substance, tetrodin, is a crystalline compound and a powerful nerve poison. Death probably results from a direct action upon the respiratory centre. The toxin, in a concentration of 0·00002 per cent., paralyses a nerve fibre in 30 minutes.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*
**Seconded for Military Service.*

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with experiments carried out in several of the West Indian islands with the object of introducing into general cultivation improved varieties or strains of sweet potato.

On page 317 are reproduced recommendations put forward in their report by a committee appointed to inquire into the prevalence, and to recomend measures for the control of, venereal diseases in the Colony of Trinidad and Tobago. These appear to have more than local application.

Insects Notes on page 314 give suggestions for the protection against weevil in corn. Another article on page 315 relates to the control of the onion thrips.

Cane versus Beet Sugar.

Why English sweet and jam makers prefer beet to cane sugar is explained in *Sugar* for July 1919.

The prejudice appears to be due to the fact that pure white beet sugar has always been cheaper and procurable in larger quantities than refined cane sugar.

Cane sugar which is not absolutely pure is inclined to be hygroscopic, that is quick to absorb moisture. When boiled, some cane sugars are stated to be very liable to bacterial action. This feature is a disadvantage in jam making.

To refine all low-grade cane sugar it would be necessary, says the article referred to, for most of the English refineries to be rebuilt, or else new ones erected to produce economical work and returns of a high percentage, unless the syrup trade extends, which is unlikely in Great Britain.

A Model of a Great Volcano.

By means of kite-views a model of the volcano Kilauea in Hawaii has been made. This model is circular in form, 14 feet in diameter, and has an area of modelling representing about 13 square miles. The scale is 1 inch = 125 feet.

This model is described and illustrated in *Nature* for August 7, 1919. In addition to the many features of interest to the student of structural and dynamical geology, the model shows very well the effects of climatic control on the vegetation, due to trade winds and altitude. To the east and north-east the forest is of a tropical nature in its luxuriance. To the west and south-west the vegetation disappears rapidly, so that on the western part of the model there appears nothing but a desert of volcanic ash.

The advantages of a good naturalistic model are many. The following are referred to in the article in *Nature* in respect of the model under notice: (1) Such a model of a volcano which changes during a generation of men is a scientific record of that locality; (2) such models are of great value in research work; for instance, volcanic bomb craters were practically unknown before this model was made, and young drainage system in the ash desert was also unknown previously; (3) the birds-eye view of an area which can be studied at leisure reveals many relations between the various features of the country which could not be well seen and studied in any other way; on account of the atmospheric conditions, no balloon or aeroplane observation or photograph could give at once such an ideal view as one obtains from this model (4) the model can be used to teach students facts in geology, geography and meteorology; (5) such naturalistic models may be used in the teaching of landscape, sketching and painting, and even in the teaching of map making.

The model was made by Mr. George C. Curtis, an American, from the kite-views referred to, which were taken by Mr. J. Fred Haworth, a merchant of Pittsburg.

The Port of Bridgetown.

An appreciative note on Bridgetown, Barbados, appears in the *Weekly Bulletin* of the Department of Trade and Commerce, Canada, for July 28, 1919. On the cover of the *Bulletin* is reproduced a photograph of a typical view of the careenage, with the steamers in the distance at anchor in the bay.

The note states: 'Nearly every ship going to the British West India colonies included in the Preferential Trade Agreement, whether from Canada, the United States or England, calls at Bridgetown, Barbados. The island of Barbados is only twenty-one miles long, and its greatest width is only fourteen and one-half miles. The island has a population of little less than 180,000, and every part of it may be said to be cultivated. the production being chiefly sugar and molasses. Bridgetown has a population of about 35,000. There are many beautiful residences in the city and suburbs. In addition to being the shopping district for the island of Barbados, Bridgetown is a wholesale centre for all the Windward and Leeward Islands, and there are a number of importing and exporting houses.'

Sponges from the British Virgin Islands.

Mr. A. E. Collens, acting Superintendent of Agriculture for the Leeward Islands, has recently forwarded an interesting report on his visit to Tortola and other Virgin Islands during last June. In this report reference is made to the occurrence locally of marketable sponges.

Several types have been found growing in shallow water, but only one, the reef sponge, is regarded as being of any value. Dredging in deep water, however, might reveal the occurrence of the Velvet sponge. The reef sponge occurs in isolated pieces attached to coral, etc., and can always be recognized by the glossy, velvety, black smooth skin, somewhat cone-shaped with large osculi.

In March 1918, a Greek exploiter searched around the shores of Peter Island and Norman Island, and his highest daily haul was between 300 and 400 sponges, according to the report under notice. These were hooked up or grained in shallow water and dived for in the deeper parts. Specimens have been secured, and it is hoped these will be forwarded for commercial valuation. At the time of their collection the Greek exploiter was giving 3 cents a sponge—an absurdly low figure if the sponges are of any real commercial value.

There is but little doubt that the cultivation of sponges, by means of cuttings attached to cement discs, could be carried on successfully in certain areas of shallow water in the Virgin Islands. It has been stated officially that the whole question of sponge production in the West Indies will shortly receive expert attention, in which case consideration will no doubt be given at an early date to the matter in the Virgin Islands.

Rise and Progress of the Cane Sugar Industry.

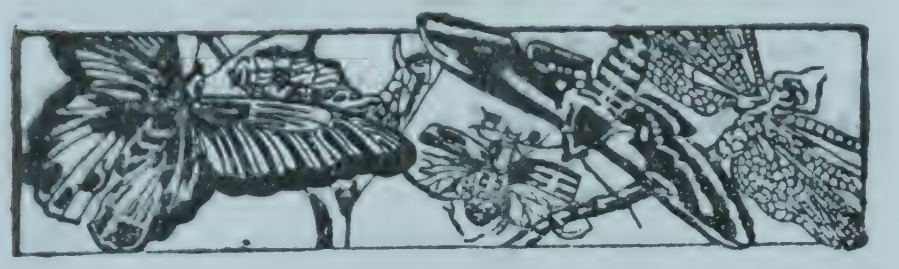
An interesting survey of the rise and progress of the cane sugar industry, by Robert Harvey, M.I.Mech.E., is published in the *International Sugar Journal* for August 1919. In this, valuable information from a historical, statistical, and other standpoints as well, concerning the introduction of sugar-cane cultivation and the manufacture of sugar into the West Indies, is given. It is stated that from the Canary Islands and Maderia the cultivation of sugar-cane and the art of making sugar were extended by different European nations to the West Indian islands and the Brazils.

In the year 1790 the amount of sugar imported from the West Indies into Great Britain was about 100,000 tons; the price of this sugar was about £33 per ton, and the import duty charged was £12 per ton, making the selling price of raw sugar in Britain at that date £45 per ton.

About 150 years ago the West Indies, we are told, then in the possession of Spain, Portugal, France and Britain, were the largest producers and the centre of the sugar industry of the world. Beetroot sugar being unknown at that date, the sugar estates were very small but in great numbers. The Portuguese were the first growers of sugar-cane in the West Indies. Immediately on their discovery of the island of St. Thomas they started this industry, and in 1520 this little island had sixty small sugar works, and produced a large quantity of sugar for those early days.

In 1641 sugar-canes were transplanted from Brazil to Barbados, and thence to other West Indian islands. The sugar made in Barbados at first, it is stated, was so bad that it was considered scarcely worth sending to England, being full of molasses. In 1650 it had improved in quality but could not compete with that made in Brazil. Sugar was made by the British in the island of St. Christopher (St. Kitts) in 1643, by the French in Guadeloupe in 1657.

References to the very crude method of extracting the juice from the cane in the West Indies and the manufacture of the sugar in vogue two hundred and fifty years ago should prove interesting reading to those concerned in the operations of sugar factories in the present day. No less interesting should be the reproduced sugar account of a plantation in Jamaica, which shows the price of muscovado sugar in the year 1718 to be £40 per ton in London, freight, duty, and all expenses paid, the planter netting, however, only £30 per ton. By the then method of manufacture, 100 gallons of juice produced 100 to 120lb. of sugar, according to the density of the juice and care in manufacture. The result of working a sugar estate in the West Indies in the days of slavery is also given. This was an estate in Barbados in the year 1822. It consisted of 314 acres, of which 80 acres were planted with sugar-cane. The entire labour consisted of negro slaves—men, women, aud children, in all 150 persons, to which was added white supervision and two white servants; the gross revenue is stated as £7,158 in round numbers, and the total expenses £3,202 (Barbados Currency).



INSECT NOTES.

PROTECTION AGAINST WEEVIL IN CORN.

In a recent article in the *Agricultural News* reference was made to the habit of the pea weevils of infesting the growing grain in the field, and continuing their depredations in storage after the crop is harvested. In the case of Indian corn a similar thing happens, and, the means to be used for protection against this sort of attack are discussed in *Farmers' Bulletin No. 915*, of the United States Department of Agriculture, entitled 'How to Reduce Weevil Waste in Southern Corn'. There has been some extension of corn growing in the West Indies as a war measure, and in connexion with the efforts to increase the supplies of locally grown food. In Antigua and St. Vincent there are government corn factories where corn may be dried and disinfected by the application of heat, and stored in insect proof bins. This provides a very satisfactory means of protecting maize from deterioration as a result of the attacks of insects, and the development of moulds and mildews. The principal method recommended for adoption by the southern farmers in the bulletin referred to is the development of a protective shuck by breeding and seed selection.

In the Southern States where the production of corn has recently been considerably increased, it is the custom to store the crop in its shucks because it is more or less vaguely known that some of the ears are protected by their shucks. It is also well known that many of the ears with a poor shuck become infested and are badly damaged, both in the ear, and in storage. The practice of storing these infested ears along with those possessing good protective shucks often results in the latter becoming infested. It is recommended that the sound ears should be stored when harvested. Those which show signs of being infested, and all that have a poor shuck covering, or one which has been damaged so that weevils may have had an opportunity to enter should be fed as soon as possible.

For weevil protection it is suggested that an adequate shuck covering for the corn ear should be developed by seed selection. For this purpose the shuck should be abundant and tight and should extend beyond the tip of the ear for several inches. Corn developed in such shucks is protected from weevil attack in the field and in storage

The corn ear worm begins its attack on an ear of corn by eating the silks at the tip and travelling along the silk channel until it comes to the developing grain. It has been noticed that in the case of well developed, tight shucks the ear worms often cut their way out before reaching the grain.

The value of shuck protection is recognized in the West Indies where it is a common practice to store seed corn in the shuck. The development by selection of an additional protection in the form of an extra long shuck is worthy of consideration in these islands, where the problem of grain storage is a serious one.

The following is quoted from the Bulletin: 'In weevil-infested regions ears with poor shuck coverings are damaged before the corn can be stored. To store corn with short, loose shucks results in greatly increased loss. Shucks that extend beyond the tips of the ears and close tightly about the silks are weevil proof both in the field and in storage.

'Feed or sell the unprotected ears as rapidly as possible.

'Store the weevil-proof ears in their shucks.

'Select the best ears, in the field if possible, for next year's seed. Be sure that these ears have long, tight shucks, so that your next crop will have better shuck protection.

A slatted crib lined with galvanized-wire netting having $\frac{1}{4}$ inch meshes is ideal for the storage of the bags of grain, because it gives good ventilation and excludes rats and mice.

H.A.B.

CONTROL OF THE ONION THRIPS.

Onion growers in the West Indies may be interested in the information contained in *Farmers' Bulletin No. 1007* of the United States Department of Agriculture, which was recently issued under the title which appears above.

The work of the onion thrips is familiar to all who have tried to grow onions in the West Indies. The peculiar whitish or silvery appearance of the leaves, and the excessive number of undeveloped and unmarketable bulbs which result from severe attacks of this microscopic insect are characteristic, and few, if any, planters, who have tried onion growing on anything like a large scale have been fortunate enough to avoid experiencing the effects of thrips attacks.

The following quotations from the bulletin mentioned above indicate the lines along which work should be done to reduce the attacks of this insect:—

'The onion thrips, a minute, prolific insect, almost invisible to the unaided eye, is the most serious menace to the onion-growing industry throughout the whole United States. The damage to the onion crop alone is estimated to be at least $2,250,000 annually, and, including the injuries to other crops, the loss will approximate $3,000,000 or more.

'The thrips preys upon cabbage, cauliflower, and similar plants, cucumber, melons, and other vine crops, and most other garden and truck crops, though it is more injurious to some than to others. It is injurious to roses and some other ornamentals and to greenhouse plants. It also breeds upon a large variety of weeds.

'Clean farming and proper crop rotation help to control the pest. Spraying with nicotine sulphate solutions has proved the most effective treatment. This bulletin gives directions for this work, with illustrations showing the outfits most effective under differing conditions.

HINTS TO THE ONION GROWER.

(1) 'Begin spraying onions as soon as the adult thrips can be seen in any numbers or the characteristic whitening of the leaves is in evidence. Do not wait until there are hundreds of young thrips and the crop is injured.

(2) 'Spray thoroughly with nozzles which produce a fine spray and hold them as near the plants as possible and at the same time cover infested portions.

(3) 'Employ sprayers that will stand at least 100 lb. pressure. If the system of planting will not permit the use of power sprayers, use good hand sprayers and keep them constantly pumped up, since thrips are not killed unless the solution strikes them with some force.

(4) 'Do not plant early cabbage or cauliflower next to onion fields if it can possibly be avoided, since it may cost you dearly with your onion crop.

(5) 'After onion, cabbage, and related crops are harvested, clean up the field and keep it clean, because thrips continue to breed on any living portion of these plants, and on almost any kind of weeds that remain in the field.

(6) 'After harvest, plough as deeply as possible, and harrow and repeat before planting the following season if onions are to be planted anywhere in the vicinity.

(7) 'Plant as early as possible and use quick-acting fertilizers where possible after the onions are well set or the bulbs have begun to form, particularly so where the fertilizer has not been applied before planting.

(8) 'Watch your onion fields constantly and keep the plants growing thriftily, since once the plants become checked in their growth from any cause, the thrips will multiply with unusual rapidity and it will be a hard fight to save the crop.

SPRAYING WITH NICOTINE SULPHATE.

'Onion growers should be able to control the thrips with the aid of the instructions here presented, provided they employ the proper sprayers for the purpose. Experts of the Bureau of Entomology who have been working on the onion thrips for several years past have been most successful with nicotine sulphate solutions.

'Where nicotine sulphate is mentioned in the formula, a solution containing 40 per cent. nicotine is understood.

'The following nicotine spray formula has been found the best for the control of the onion thrips:—

Nicotine sulphate (40 per cent.)	$\frac{3}{8}$ pint
Soap (dissolved)	4 or more lb.
Water	50 gallons

'This formula gives 1 part nicotine sulphate to 1,000 parts water.

'The quantity of soap required will vary with the quality of water, more soap being required in 'hard' water; but on the average, the proportion specified in the formula will give satisfaction. An examination of a freshly sprayed leaf will show whether there is sufficient soap in the mixture. If the spray draws together in drops, and leaves a part of the foliage dry, more soap should be added. Where possible, fish oil soap should be used, but if it cannot be procured, cheap laundry soaps will do. The composition of the cheap soaps is variable, and if too much soap is used, some injury may result to tender foliage, especially if applied in the hot sunshine.

'In the use of nicotine sulphate the effective application of the spray is of the utmost importance, since it is primarily upon this that the success or failure of the treatment depends. If the liquid has stood for any length of time it should be agitated thoroughly before use. The insects themselves must receive a thorough coat of the spray or they will not be killed, and immediate inspection after spraying should show the foliage occupied by the insects to be completely wet.

'Spraying should be done always on the first appearance of the insect, not only because it is good practice to keep the plants free from pests, but because more thorough work can be done on small plants.

'When spraying is once begun it should be continued at frequent intervals, as often as from seven to ten days, if necessary, provided there is no heavy rainfall during this period, and no surrounding breeding host for the insect. The spraying should, as a general rule, be continued up to within three or four weeks of harvest time.'

H.A.B.

Rats Troublesome in Trinidad.—At a recent meeting of the Trinidad Board of Agriculture, says the *Port-of-Spain Gazette*, Mr. Urich reported that the cacao beetle campaign was going on, but the beetles themselves were in abeyance owing to the rains. Thrips had not made any appearance yet in numbers. Sangre Grande district was pretty free, and in Toco district there were just slight indications of increase, but not enough to warrant spraying. The pests giving trouble now in Tobago and on the North Coast were rats. In spite of the presence of the mongoose on the North Coast, rat damage went on. Small plots of canes were being cultivated at Woodbrook near the Electric Light plant, and the rat damage was very extensive to the canes, although there were, he felt, a good many mongoose about the field there. The rats on the northern range took care of themselves by climbing up trees. In connexion with the rat depredations, phosphorus poison had been successfully used. As that, however, was apparently no longer available, barium carbonate mixed with arsenic was suggested.

Trinidad Exports.—The following figures show the exports from Trinidad for the period January 1 to August 31, 1919. These are official returns published in a recent issue of the *Port-of-Spain Gazette* (Trinidad):—

Asphalt	...	...	39,807 tons
Balata ...	...	...	2,165 lb.
Bitters ...	...	...	8,182 gallons
Cocoa ...	...	...	54,937,634 lb.
Coco-nuts	...	...	19,398,050 number
Coffee ...	...	...	148,439 lb.
Copra ...	...	...	1,605,522 lb.
Honey ...	...	...	44,827 lb.
Limes ...	...	...	2,486 number
Lime Juice	...	..	4,450 gallons
Lumber (cedar boards)		...	9,036 sup. ft.
Manjak...	...	...	89 tons
Molasses	...	...	236,475 gallons
Oranges	..	...	600,193 number
Petroleum (crude)		...	31,706,921 gallons
,, (kerosene)		...	1,511,050 gallons
,, (gasolene)		...	827,886 gallons
,, (lubricating oil)		...	8,333 gallons
Rubber...	...	...	24,673 lbs.
Rum ...	...	...	123,631 gallons
Spices (nutmegs, etc.)		...	5,175 lb.
Sugar ...	...	...	34,336 tons
Timber (cedar logs)		...	1,984 cub. ft.
,, (other than cedar)		...	55 cub. ft.

In dealing with bites and stings produced by insects and their allies, Mr. G. E. Bodkin, in the *Journal of the Board of Agriculture of British Guiana*, says that the crimson colour of bête rouge is not due to ingested blood, for this creature does not suck blood, but merely enters a sweat pore of the skin and induces intense irritaion. Thick grease or soap effectively prevents the bête rouge from crawling on or penetrating the skin.

The different varieties of sugar cane under cultivation in British Guiana during 1918 is dealt with in the *Journal of the Board of Agriculture of British Guiana* for April 1919. Under D.625 there were 22,538 acres; under B.208 there were 3,453 acres; and under Bourbon 3,185 acres. These were the three principal varieties in regard to acreage.

GLEANINGS.

Acording to results obtained in the Dutch East Indies, referred to in *Experiment Station Record* for May 1919, sodium nitrate is superior to ammonium sulphate as a manure for cassava.

An article appears in the English *Journal of the Board of Agriculture* on the subject of oil from British-grown linseed. Investigations have shown that there is now in England the certainty of producing an appreciable quantity of high class oil.

On applicants in St. Lucia producing a paper from the Crown Lands Department showing the amount of land purchased, locality, and full name and address, they are provided with free planting material by the agricultural department.

One result of the war was the employment in Hawaii of children on sugar estates for planting cane. It appears likely that the empoyment of school children for planting and other light work will be continued, as it is found that boys can work quicker than men. (*Louisiana Planter* for July 12, 1919.)

The imports of unrefined sugar from the British West Indies into the United Kingdom during 1918 were 2,307,802 cwt., valued at £3,342,068. In 1917, the imports were 2,587,841 cwt., valued at £3,736,436. These figures include sugar from British Guiana. (The *Chamber of Commerce Journal*—Supplement, London, July 1919.)

The imports into Canada from the British West Indies for the year ending June, 1919, were valued at $8,336,966. The exports from Canada to the British West Indies for the same year were valued at $9,648,933. These figures do not include British Guiana. (See *Agricultural News* for Sept. 20, 1919, p. 297.)

According to a report in *Tropical Life* for August 1919, it seems likely that this year's cacao crop in Ecuador will be an average one, perhaps a little short. This shortage is in part due to disease, but chiefly the result of the trees becoming older year by year, and the absence of many young plantations coming into bearing to take their place.

Manurial experiments with tobacco in Java have shown that ammonium sulphate gave not only increased yields, but caused an improvement in quality and increase in length of leaves. Stable manure seemed to cause inferior combustibility. This is ascribable to the chlorine content of the manure. (*Physiological Abstracts* for June 1919.)

It is stated in the *Cuba Review* for July 1919, that great efforts are being made to increase the output of the Cuban manganese mines. The manganese ores occur principally in sedimentary rocks such as limestone, sandstone and shale, but in the more heavily mineralized localities the ores are associated with masses of siliceous rock locally termed 'jasper' and 'bayate'.

The University of the Philippines has discovered that the highest percentage of eminently successful students (in the academic sense) is not associated with its school of agriculture. The College of Law was found to have the highest percentage (16) of grade 1 students, while the College of Agriculture had the smallest percentage (2). This marked difference would seem to indicate that the former college attracts more bright students than the latter.

'A Practical Guide to Tropical Agriculture' is a recent book by A. Fauchere, referred to in the *Experiment Station Record* for May 1919. It is a treatise which has to do primarily with the development of agriculture in the French Colonial possessions. Amongst other matters it deals with the preparation of the land for cultivation, including clearing, draining, ploughing, and the construction of roads and buildings.

The data adduced in *Bulletin No. 4*, Statistical Series, Department of Agriculture, Mauritius, show that during the last four years the total number of stock in that colony has diminished by over 8,000 head. In commenting on this, Dr. H. A. Tempany, the Director, says that such a diminution is serious, and directly affects the principal industry as well as the welfare of the colony as a whole. It is believed there has been a tendency towards diminution of live stock in nearly every country throughout the world during the war.

Reference is made in the *British Empire Associated Chambers of Commerce Directory and Gazette* for June 1919, to a hand plough which is likely to be of use for saving labour on small holdings It is known as Mote's Interchangeable Hand Plough. It is very light and will cut 6-inch furrows easily. It takes two men to work it, one pulling and the other guiding. This plough should do much to abolish the rough spade work which hitherto has been the bugbear of the small cultivator. It is manufactured by Mote's Man Power Plough and Implement Co., Poulton-le-Fylde, Lancashire, and the London Office is 7, Pall Mall, S.W.

An advertisement containing a significant statement, appears in *Facts about Sugar* for July 19, 1919, in regard to a large financial concern known as the Haitian American Corporation. In the prospectus, to secure public confidence, it is observed that 'the United States, in 1916, entered into a treaty obligating itself, through control of the Constabulary and Finances, to lend its good offices to the Government of Haiti and aid in the development of its agricultural, mineral and commercial resources'. This is instructive in connexion with the present agitation for self-government and independence in some of the British West Indian colonies like Grenada and St. Lucia.

VENEREAL AND OTHER DISEASES.

Public health is all-important in the tropics. On its maintenance depends the happiness of the people, and the standard and efficiency of productive work. The principal diseases affecting people in the West Indies are tuberculosis, malaria, hookworm disease, and venereal diseases. The loss of efficiency caused by these diseases is enormous.

Tuberculosis could to some extent be prevented by better housing, particularly in regard to ventilation at night. It could also be checked if it were possible to secure a perfectly pure milk, and a perfectly sound meat supply.

The prevention of malaria depends principally on protection from Anopheles mosquitoes. Quinine is of no value as a prophylactic; it is only of value as a temporary cure.

Hookworm disease, which is frequently referred to in the *Agricultural News*, can be easily cured, and could be prevented altogether by the general adoption of sanitary measures amongst the labouring classes

Venereal diseases are the most difficult to deal with, and at the same time the most perilous and insidious diseases in their effects. It is almost impossible to gauge the loss of efficiency caused by these diseases. For a plain statement of facts the reader is referred to Council Paper No. 89 of 1919, issued by the Government of Trinidad This is a report of a Committee appointed to enquire into the prevalence and to recommend measures for the control of venereal diseases in the colony of Trinidad and Tobago.

A great proportion of the high infantile mortality in these colonies is caused by venereal diseases These diseases, chiefly syphilis, are also the principal cause of blindness, deafness, thickening of the arteries, locomotor-ataxy, general paralysis of the insane, and many other afflictions.

Given below are the recommendations put forward by the Committee in Trinidad ; but every reader is advised to study the report, which is a very able one, in full.

RECOMMENDATIONS.

1. The systematic education of the public as to the nature and perils of venereal diseases by the Government as well as by voluntary organizations formed for the purpose of preventing these diseases.

2. The provision by the Government, free of cost to the public, of the most modern means for the early diagnosis of venereal diseases.

3. The provision by the Government of suitable literature on the question of venereal diseases and their prevention to all medical practitioners in and out of the Government medical service for distribution to patients suffering from venereal diseases.

4. The establishment by the Government of special evening clinics at the Colonial Hospitals in Port-of-Spain and San Fernando, and in other populous centres, on the lines adopted in Jamaica, for the gratuitous treatment of venereal diseases by the most modern methods.

5. The rigid enforcement of the provisions of the Summary Convictions (Offences) Ordinance relating to women who loiter on the streets and solicit passengers for immoral purposes, and the appointment of Policewomen to prevent this form of traffic.

6. Compulsory medical treatment during the period of their incarceration of women found, after conviction for the offences referred to in the next preceding recommendation, to be suffering from venereal disease, and their further detention in Hospital if, on the expiration of their sentence, they are still uncured and in a condition dangerous to the public health ; other infected prisoners to be treated during incarceration and, if necessary, encouraged after liberation to attend regularly at the nearest health office or hospital to complete their cure.

7. The introduction of legislation for preventing the treatment of venereal diseases otherwise than by registered medical practitioners.

8. The addition of ophthalmia neonatorum to the list of infectious diseases notifiable under the provisions of the Public Health Ordinance, 1915

9. The provision by the Government in Constabulary Barracks and similar establishments, and compelling the provision by employers on estates and other labour centres, of facilities for obtaining calomel ointment and permanganate of potassium, free of charge, for use in anti-venereal prophylaxis.

10. The Government to request the Medical Board to include in the regulations issued for the observance of midwives (1) the taking of all necessary prophylactic measures against ophthalmia neonatorum when attending on a parturient case, (2) the obligatory duty of summoning a medical practitioner immediately in every case of ophthalmia neonatorum.

11. The Board to be further requested to urge upon medical practitioners the importance of including, when possible, the cause of death on certificates of death issued by them in respect of still-born children.

Weather in St. Croix.—The weather which had been somewhat disturbed in the early part of the week, is again normal, the cyclonic disturbance having fortunately passed us without touching this island. On the early morning of Wednesday the town was aroused concerning the weather which had appeared disturbed from Tuesday afternoon. The Weather Bureau at San Juan reported moderate disturbance forming over Leeward Islands, apparently moving northward, lowest barometer at 8 p.m. 2nd, 29·76 at St. Kitts ; caution advised. The barometers in this town which had been gradually falling, the lowest record being as far as we know, 29·75, commenced to rise again at 6 a.m. ; $32\frac{1}{2}$ lines of rain were measured at the Fort on Thursday morning (1 line = $\frac{1}{12}$ inch). (From the St. Croix *Avis*, Saturday, September 6, 1919.)

The Value of Cultivating.—The Trinidad cane field, reported in August to the Board of Agriculture, as showing distinctly the beneficial effect of forking the land, continues to show the same differences in favour of the cultivated part. The canes on this part of the field which were at first a little smaller than those on the unforked areas are now as big if not bigger than the latter, and much healthier. This indicates the value of increased cultivation as a remedy against fr ghopper and other maladies of the sugar-cane in Trinidad.

The rainfall in Trinidad was slightly deficient during the early part of August in continuation of the somewhat dry weather of July. Heavy rains fell towards the end of the month. (*Port-of-Spain Gazette.*)

POSITION OF COLONIAL CREDIT SOCIETIES.

The working and position of Agricultural Credit Societies in St. Vincent, St. Lucia, Mauritius and Ceylon is dealt with in four publications recently received, namely; St. Vincent *Government Gazette* (September 11, 1919): St. Lucia *Government Gazette* (June 14, 1919); *International Review of Agricultural Economics* for May 1919 (dealing with Mauritius); Ceylon Administration Reports (Co-operation Credit Societies, Report of the Registrar for 1918-19).

Information brought together from these sources in the following note is likely to prove interesting to readers, if only from the point of view of the comparison it affords.

ST VINCENT In St. Vincent there were twenty-one societies registered up to March 31, 1919, and the total number of members was 1,060. The increase in the number of members amounted to 135 on that of the previous year.

The strict observance of the date of repayment of all loans and for the payment of interest continues to be the characteristic of every society.

During 1918-19 the societies borrowed £4,441, principally from the Colonial Bank, Ltd., rate of interest being 8 per cent. It is interesting to note that in 1914-15 a private individual lent the societies a small amount at 10 per cent. Loans were first obtained from the Government (in 1913-14) at 6 per cent, but money was subsequently obtained each year from the Colonial Bank and from Provident Societies.

	£	s.	d.
Loans repaid during 1918-1919 amounted to — — —	3,450	0	0
Total sum repaid from the establishment of the societies to March 31, 1919	13,196	0	0
Interest on loans paid in 1918-1919 was	331	17	8
Total interest paid from date of establishment to March 31, 1919 —	867	5	9

ST LUCIA. In St. Lucia there were ten societies registered up to March 31, 1919, and the total number of members was 381. The number of members shows an increase of seventy-two during the year under review

The year's working can, on the whole, be considered as satisfactory, the interest on all loans due to and by the societies have been settled to date. The members of the societies have during the year either endeavoured to improve their cultivated areas, or cleared lands lor planting up fresh crops, particularly sugar-cane.

The amount of loans due to the Colonial Bank by the societies on 31.3.19. was £2,420, an increase of £1,189 on the previous year. The loan of £288 borrowed from the Government by the Soufrière, Choiseul and Micoud Societies has been repaid, and another for a similar figure has been obtained from the Colonial Bank.

Produce to the value of £270 was handled by the societies during the year

MAURITIUS. In 1918 there were twenty-three societies and this number has not changed since 1915, when the number was twenty. The total number of shareholders has undergone in the whole period (1914-18) a slight diminution, falling to 2,767, or an average of 120 a society. The loans due on June 30, 1918, amounted to Rs. 270,541, having increased by more than Rs. 16,000 since the previous year. In 1918 the total share capital was Rs 121,270 the amount deposited by members was 35,735, by non-members 31,225; Government loans, 37,370; Reserve funds, Rs. 44,589.

Practically all the loans were for productive purposes. The average amount of a loan was Rs. 157.

Three societies had been working five years since the date of their registration, and were entitled in consequence to declare a dividend. Two of them resolved to abrogate a dividend for one year more, in order further to improve the position of the reserve funds, while the third declared a dividend of 7 per cent.

CEYLON Progress has to be recorded during the year, particularly by some of the older societies which had previously been performing good work. It takes two years before newly formed societies makes general and sound progress.

The credit societies movement was started in 1913 and there are now 103 societies. The best progress has been made by societies in the Western, Southern and Northern Provinces. Little or no progress can be reported for societies in the Central Eastern and North-central areas.

The total number of members is 11,310. The paid up capital is Rs 68,062·55 as compared with Rs. 48,549 in 1917-18. The amount of money on deposit was Rs 4,772·51 as against Rs. 2,646·10 in the preceding year. During 1918-19 the societies gave loans amounting to Rs. 74,605; loans recovered amounted to Rs. 50,934·74; loans outstanding, Rs. 70 605·45. It is reported that greater attention must be given by committees to the recovery of loans. The Loans and Development Commissioners of Ceylon granted the societies loans amounting to Rs.5,550 at 5 per cent.

The rates of interest are being generally maintained. The rates on loans range from 6 to 12 per cent., and upon deposits from 2 to 5 per cent.

The total profit earned by all the societies during the year under review is Rs.7,297·03, and the working expenses on stationery, postage, and on transport of manure amount to Rs 1,179·67, leaving a nett profit of Rs.6,117·36.

The following, viz, Minuwangoda. Government Printing Office, Udappidili, Tellippalai, Handapangoda, Kumbuke Pattu, Dakunu Talangama, have declared bonuses to members on their shares, and an amount of Rs 1,180·57 has been set apart for this purpose.

The total amount now standing to the credit of the reserve fund of all the societies is Rs.11,243·27. This shows an increase of Rs.4,566 over last year The reserve fund of the societies covers more than a sixth of the paid-up capital of all the societies.

Sugar-cane sets with a single eyebud, sown with the bud turned upward, are said to have shown a germination of about 80 per cent., the plants germinating simultaneously, and germination occurring one week earlier than with ordinary sets sown in the usual way. The cane is also said to be less liable to lodge, and to facilitate cultivation between the rows. Due to the high rate of germination obtained with this method, the tillers are removed and only the mother canes allowed to devolop. Earliest germination with cotton was obtained when the seed was planted with the apex turned upwards. These results have been obtained in India and are reported in *Experiment Station Record* for May 1919.

ST. LUCIA PRIZE HOLDINGS COMPETITION, 1918-19.

The Report of Mr. Buckmire, Agricultural Assistant, on the above competition was published in recent issues of the *Voice of St. Lucia*, from which the following extracts have been taken:—

LIME COMPETITION—CASTRIES. The object of this competition as detailed in the Agricultural Department Report of 1916-17 is to extend Lime cultivation in the districts where soil and other conditions are well suited to the cultivation of this plant, and to give such cultural instruction and supervision during the first two years as would ensure the permanent establishment of the plots and serve as object-lessons to the growers.

The area covered in the competition was large and extended from Vide Bouteille to Garand, Babonneau, and from Morne Dudon and Ciceron to Ansela-Raye.

BRINGING IN LIMES, ON AN ESTATE IN ST. LUCIA.

Thirty-four plots were entered for planting limes, but up to July sufficient work to justfiy marking was done only in fourteen plots, and out of this number the requirements of the competition were carried through to the end on eleven plots.

Most of the growers showed great interest and followed the instructions given them in every detail. On most of the plots the plants were quite regular and wind-belts and other shelter crops were established. The young plants were thriving nicely and showed very satisfactory promise.

LIME COMPETITION—SOUFRIERE. At the commencement when the Prize Scheme was laid out to the growers in this centre ten peasants gave in their names. The plots were visited and marked and cultural instructions given the growers on the spot To six of these men who showed more than ordinary interest sufficient lime plants were distributed to plant up acre plots at 20 feet apart.

The condition of the plots during later visits showed a careless interest generally not only in the cleanliness etc, of the plots but in the manner they were planted out.

In only one plot was the distance of 20 feet apart adhered to, and on plots about 50 per cent. of the plants put out became established,

CACAO COMPETITION. The object of this competition is also detailed in the Agricultural Department report 1916 17, and is to improve the general condition of bearing cacao plantations among the peasants. It is open for a period of one year to persons owning not more than 20 acres of land.

The number of persons who entered this competition was eleven. The plots were visited, and cultural instruction given to the growers on the spot in the same way as was done in the Lime competition.

Eight of these growers worked in a more or less satisfactory manner throughout the competion.

ONION GROWING IN DOMINICA.

The experiments in onion growing have been continued at the Spring Hill estate, and notes on the progress made have been published in the *Agricultural News* from time to time.

These experiments have shown that in Dominica it is desirable to use a considerable proportion of the seed, which is received from Teneriffe about September-October of each year, for the production of sets which can be grown and stored and then used for successive monthly plantings from May until about October. Onions grown directly from seed sown in October would mature during the following March and April, and if sets are planted with the rains early in May, these would mature three months later. By successive plantings of sets from May onwards, onions could be reaped from August until the following January.

Now that these points have been made clear, and the suitability demonstrated of certain parts of the leeward coast for growing onions, it is hoped that sufficient interest will be taken in this subject to follow up the lead given by Mr. Seignoret, and that within a short time sufficient onions will be produced to supply local requirements. As an aid to this end, the Agricultural Department has raised and distributed during the season a large number of sets and seedlings to interested persons.

The question of seed production is also being considered, and the results so far are promising. It was found that while sets planted in May and the following months showed no tendency to seed, a proportion of those planted towards the end of the season, when the sets had passed into their second year. did so. Experiments with this locally produced seed will shortly be made and reported upon. It is probable that seed production in the West Indies is a matter of age of the bulb and season. Once these have been determined, it may be possible to raise seed locally, instead of, as now, being entirely dependent on other countries for supplies.

It is hoped that close attention will be given by a few interested persons to this cultivation. In an island which practically depends upon orchard cultivation, the establishment of even a small industry, the crop of which would bring in ready money after about five or six months, is desirable, and would prove very helpful, especially to small growers. There is nothing very difficult to learn about the cultivation: the trouble would be to secure that attention to detail and the carrying out of the work at the right time by persons who for a long time have been used to orchard cultivation, which, generally speaking, is carried on in Dominica in a manner by no means exacting in regard to seasonal requirements and to methods of work. (Report on the Agricultural Department, Dominica, for 1918-19.)

MARKET REPORTS.

London.—The West India Committee Circular, August 21.

Balata—Venezuelan Block, no quotations; West Indian Sheet, 3*s*. 11*d*.
Beeswax—No quotations.
Cacao—Trinidad, 123*s*. to 128*s*.; Grenada, 116*s*. to 126*s*.; Jamaica, St. Lucia, St. Vincent, and Dominica, 115*s*. to 127*s*. 6*d*.
Copra—£60
Honey—Jamaica, Very quiet.
Lime Juice—Raw, 2*s*. 9*d*. and 3*s*.; Concentrated, no quotations.
Pimento—5¾*d*.
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

London.—The Perfumery and Essential Oil Record, August 20, 1919.

Bay Oil—16*s*. to 17*s*.
Lime Oil—Flat, at 3*s*. 10½*d*. for West Indian distilled, and 11*s*. for hand-pressed.
Orange Oil—West Indian, 8*s*. 6*d*. to 9*s*.

Barbados—Messrs. T. S. Garraway & Co., September 16.

Arrowroot—$8·00 per 100 lb.
Cacao—$22·00 to $24·00 per 100 lb.
Coco-nuts—$60·00 husked nuts.
Hay—$4·50 to $4·75 per 100 lb.
Onions—$12·00.
Peas, Split—No quotations; Canada, $8·50 to $10·00.
Potatoes—No quotations
Sugar—Embargoed.

Trinidad.—Messrs. Gordon, Grant & Co., July 4.

Cacao—Venezuelan, $26·00; Trinidad, $24·50.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 20c. per lb..
Copra—$9·00 per 100 lb.
Dhal—$10·50.
Onions—$9·00 to $9·25 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $5·00 per 100 lb.
Rice—Yellow, $12·00; to $13·00 White, $12·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., September 9.

Cacao—Caracas, 26½c.; Grenada, 24½c.; Trinidad, 25c.; Jamaica, 20c.
Coco-nuts—Jamaica selects, $85·00; Trinidad $60·00; culls, Jamaica, $85·00; Trinidad $60·00 per M.
Coffee—Jamaica, 24c. to 28c. per lb.
Ginger—20c. to 23c. per lb.
Goat Skins—Jamaica $1·60; Antigua and Barbados, $1·40; St. Thomas $1·50, and St. Kitts, $1·60.
Grape Fruit—Jamaica, $7·50.
Limes—No market.
Mace—40c. per lb.
Nutmegs—18½c.
Oranges—$2·50.
Pimento—9¼c. per lb.
Sugar—Centrifugals, 96°, 8c. to 8¼c; Muscovados, 89°, 7c. Molasses, 89°. 6·85c. all duty paid.

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Montserrat: Mr. W. Robson, Botanic Station.
Antigua: Mr. S. D. Malone, St. John's.
St. Kitts: The Bible and Book Supply Agency, Basseterre.
Nevis: Mr. W. I. Howell, Experiment Station.
Canada: Lewis W. Clemens, 801, Yonge Street, Toronto

AGRICULTURAL NEWS.

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CONTENTS.

	PAGE.		PAGE.
Aerial Mail Service, Indo-Burma	353	Flagstaff at Kew... ...	329
Animals, Wild	329	Fruit Culture in Malaya	329
Botany, The Fundamentals of	334	Gleanings	332
British Guiana, Recent Exports from	323	Horse Marmalade ...	325
Cacao and Coco-nuts in Dominica	327	Industrial Instruction for Girls	334
Castilloa Rubber... ...	335	Insect Notes :—	
Cotton :—		'Entomology'	330
American Cotton ...	331	Popular Entomology ...	330
Origin of Sea Island Cotton	326	Items of Local Interest ...	324
Sea Island Cotton Market	326	Labour and Emigration	329
Cotton Factory, Tortola	333	Land Settlement, Private, in Antigua	328
Departmental Reports ...	333	Limes, Budded	327
Dominica, Report on ...	323	Market Reports	336
		Salt and the Growth of Coastland Plants ...	321
		Sands, Mr. W. N. ...	328
		West Indian Products ...	335

Salt and the Growth of Coastland Plants.

A LARGE proportion of the cultivated land in the West Indies lies around the sea-coast. On it we find cultivated, sugar-cane, cotton and coco nuts principally, and growing wild, down to the margin of the sea, a well-defined flora of salt-loving or salt-tolerating plants which botanists include under the general term of halophytes.

The soil in which these plants grow—not only the true halophytes but also the cultivated crops—must periodically become impregnated with salt. It may, therefore, prove interesting to consider the relation of salt to the growth of halophytes, and the cultivated crops mentioned.

The coco-nut forms an interesting study in this connexion, for this plant will tolerate considerable quantities of salt; and at the same time thrive equally well in its absence. The widespread belief that the coco-nut needs salt for its development is unfounded. Copeland (1) states: 'I do not know of any good evidence that the coco-nut demands salt for its best development . . . . . the coco-nut roots can indeed endure considerable salt . . . . . but the fact that the coco-nut can endure salt-water is by no means a proof that it needs it.'

Coco-nut roots are peculiar. They have no root hairs. Water is absorbed through a small region behind the root-cap. According to Copeland, 'the coco-nut must be said to have a root system ill-adapted to the absorption of large quantities of water, but its structure enables it to endure saltness and dryness which would be fatal to most other plants. Beach soil usually contains no salt, except in such minute quantities as chemical analysis will detect in all soils; but it sometimes happens, as a result of storms, that the beach is temporarily filled with sea-water. This would kill any plant with ordinary roots, but does the coco-nut practically no harm at all.'

Under conditions of drought the impermeable hypodermis or skin of the root approaches closer and closer to the tip, until if dryness is severe enough, it reaches the root-cap. Thus the roots can automatically check the absorption of water without dying. The roots under ordinary conditions will absorb salt solutions up to considerable concentrations, but their structure renders them safe against concentrations that are high enough to be toxic.

The amount of water that can be absorbed by the coco-nut is relatively great, and transpiration in sunlight is very rapid. It is interesting to note here that recent investigations in England have shown that surprisingly high transpirations are characteristic of many halophytes. It has also been shown that red and purple leaves transpire more rapidly than green leaves. This is of particular interest in view of the various opinions that have been put forward with regard to the physiological rôle of anthocyan (red colouring matter) of plants. It will be remembered that the young leaves of the Seaside Grape (*Coccoloba uvifera*), a typical West Indian halophyte, are nearly always red or yellow.

Returning to the question of salt-solution in the soil, it has been indicated that the roots of the coco-nut, according to Copeland, protect themselves against high concentrations by means of the growth of the hypodermis. Now in most halophytes the arrangement is entirely different. According to Hill, (2) true halophytes, which require common salt for successful growth, can adapt themselves to alterations in concentration otherwise. This is effected by the root-hairs which can accommodate their internal osmotic pressure as the salinity of the soil-water falls in concentration, and conversely, the root-hairs can raise their osmotic strength as the salinity of the surrounding soil-water increases.* This result is of fundamental importance. It explains the reason how halophytes exist under constantly changing saline conditions. It shows that plants which are devoid of this capability must suffer and eventually die out under saline conditions.

The question now arises as to whether sugar-cane or cotton is adapted in any way physiologically to withstand alterations in the salinity of soil-solution. According to Harrison (3) the soil water in the fertile parts of the Experimental Fields at the Botanic Gardens, British Guiana, contains in one acre, to a depth of 12 feet from the surface, about 43 tons of sodium chloride (common salt), as well as considerable but much smaller quantities of other salts.

In this connexion Harrison states: 'The marked alkalinity and the high content of salts of magnesium and sodium chloride of the ascending subsoil water act detrimentally on growing crops during dry seasons, and may be the cause of much of the cessation of active growth, of the wilting and of the scorching of crops soon after the commencement of and during the dry season.'

On the authority of Maxwell, it is stated that in ordinary soils a percentage of sodium carbonate exceeding 0·15 per cent. will prevent a normal growth of cane. In Porto Rico, Zerban (4) has found a combination of bicarbonic acid and chloride up to 0·4 per cent. harmless. It appears that cane in its later stages of growth may stand a much higher quantity of salt without visible injury. It may be noted that an occasional flooding with sea-water on many West Indian cane fields has been found actually beneficial; but, according to Prinsen Geerligs, this is due to the chemical effects on the soil rather than to any physiological action upon the cane itself.

As in the case of bicarbonic acid, the presence of nitrogen and calcium lessens the toxic action of common salt.

It is clear from Zerban's work in Porto Rico* that salt when present alone in large quantities (say 2 per cent.) greatly lowers the yield of cane, and as well, has a most deleterious effect upon the composition of the juice.

Nevertheless it would appear that while chlorides are inimical to the growth of the sugar-cane, this plant can to some considerable extent adapt itself to grow in the presence of appreciable concentrations. No information is available concerning the physiological action of the root of this plant such as has been recorded with regard to the coco-nut and the true halophytes.

The facts given in regard to British Guiana point to the fact that salinity may arise from the subsoil as well as from high tides and storms—a point which Copeland appears to overlook in regard to the adaptability of the coco-nut.

* Osmosis is the interchange of two fluids of different densities when separated by a porous membrane. In the case of root-hairs, osmosis takes place between the cell-sap, and soil-solution through the porous membranes of the cytoplasm of the cell.

* Zerban's figures are expressed in percentages and Harrison's in tons per acre, so that comparison is difficult.

We have referred to the effect of common salt upon the process of transpiration in halophytes. It is probable that an opposite effect is produced in the case of non-halophytes.

In regard to the former class, investigations described by T. H. Hill have shown that the aerial parts of halophytes can absorb both fresh and sea-water, and thus can take advantage of any rain, dew, or sea-water which may wet such regions. Halophytes can also absorb moisture from the atmosphere, and finally, during drought some parts of a plant can be kept alive at the expense of water in other parts. It is improbable that these characteristics occur in the case of the coco-nut and sugar-cane, except perhaps, in regard to the last-mentioned feature.

Concerning photosynthesis, or the building up of carbohydrates by green leaves in sunlight, Palladin (5) states that excess of salts in the soil has a retarding effect upon this process. Watering with sodium chloride solution caused development to cease in most plants (non-halophytes), through the checking of photosynthesis. It is also due to stomatal closure, caused by excess of salts. If the leaves are slightly wounded so as to facilitate entrance of carbon dioxide into the tissue, starch accumulates about the wound margins. True halophytes grow, though slowly, upon soils rich in salts, since their stomata do not close at all.

The main conclusions arrived at from the foregoing are information that the roots of plants that require common salt or may be subjected to salinity without injury, can adapt themselves physiologically to changing conditions of salinity. This is particularly true of halophytes; it is probably true of such a plant as the sugar-cane; it is certainly true of the coco-nut, which may be described as a facultative halophyte. As regards such plants as cotton and sweet potato, which are commonly seen cultivated on lands adjoining the sea, there is no available information. The effect of salt in maritime plants is not to reduce absorption and transpiration of water. In the case of non-maritime plants there is a distinct tendency to reduce absorption, transpiration, and photosynthesis. The effect of common salt is greatly modified by the presence of other substances in the soil-solution.

(1) E. B. Copeland: 'The Coco-nut (1914)'.
(2) T. H. Hill: 'The Water Economy of Maritime Plants', *Science Progress*, July 1919.
(3) J. B. Harrison and F. A. Stockdale, *West Indian Bulletin*, Vol. XIII.
(4) F. W. Zerban, 'The Salt Marshes of the North Coast of Porto Rico.' *Bulletin No. 4*, Experiment Station of the Sugar Producers Association of Porto Rico (1913).
(5) Palladin's Plant Pysiology, p. 36.

Recent Exports from British Guiana.—The following figures, published in a recent issue of the Demerara *Daily Argosy*, are interesting. A large increase in the exports of most products for this year's period will be noticed. One exception, however, occurs in the case of rice. In this connexion the reader is referred to a note on the export of rice from British Guiana, on the Gleanings page of this issue:—

	From Jan. 1 to Sept. 18, 1919.	To same date 1918.
Balata—lb.	368,688	376,091
Cattle—head	1	306
Charcoal—bags	31,270	27,383
Coco-nuts—number	2,855,414	811,452
Cacao—lb.	—	9,541
Coffee—lb.	888,561	327,517
Copra—lb.	130,740	225,145
Fish Glue—lb.	6,032	25,174
Gums—lb.	2,001	60
Hides—number	5,153	2,263
Kola Nuts—lb.	—	2,687
Leather—lb.	—	320
Lime, Citrate of—lb.	24,232	1,760
Lumber—feet	172,521	84,131
Molascuit and Cattle Food—tons	819	1,876
Molasses—galls.	171,247	28,186
Pigs—number	—	—
Railway Sleepers—number	1,508	6,510
Ricemeal—tons	—	66
Rice—lb.	7,074,054	17,859,370
Rubber—lb.	7,551	15,867
Rum—galls.	3,350,464	1,942,004
Sheep—number	—	10
Shingles—number	1,863,700	1,954,000
Sugar—tons	42,207	63,802
Timber—cubic feet	97,344	7,907
Woods (Firewood, Wal'aba)—tons	5,787	5,023
Gold—oz. (1919)	11,567	$205,808·00
Gold—oz. (1918)	16,574	$300,923·00
Diamonds—carats (1919)	11,412	$234,705·00
Diamonds—carats (1918)	9,092	$100,492·00

The Dominica Report.—The following appreciative statement appeared in a recent issue of the *Port-of-Spain Gazette* (Trinidad). The Report on the Agricultural Department, Dominica, for the year ended March 31, 1919, is to hand, and to us is certainly the best report issued in the Nothern Islands for some years past. Considering that Mr. Joseph Jones, the able Curator, was, so to speak, single-handed for some time owing to Mr. G. A. Jones, Assistant Curator and Chemist, (who is now in the employment of the U.S.M. authorities down south) having left Dominica in 1917 to undertake war work in England, a most creditable record is shown. The Report, unlike many similar records which are invariably dry as dust, is undoubtedly worthy of perusal and study.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. The Agricultural Superintendent, Mr. W. N. Sands, writes to say that wet weather was experienced during the month of August, but crops were not seriously affected, except in places where drains overflowed. On August 9, the last of the bales of cotton of the 1918-19 crop were shipped by the SS. 'Sargasso.' Adult cotton stainers were reported in cotton planted in May, at Grand Sable, Mount Bentinck, and Spring estates, and were being energetically collected.

The Agricultural Superintendent visited Ratho Mill estate to inspect a field of a pure strain of cotton being grown there for purposes of obtaining seed for the Department. Visits of inspection were also paid during the month to cotton and coco-nut cultivations at Grand Sable, and the Carib Country estates. About 500 young coco-nut plants had been turned over by a strong westerly wind a few days previously. Advice was given as to re-setting these, and the planting of Gliricidia wind-breaks across exposed portions of the cultivation. At Grand Sable, early planted cotton fields were inspected for insect pests. Adult cotton stainers which had arrived in one field were being systematically collected, with satisfactory results. Diamond and the Buccament Valley were also inspected. Throughout the district visited, Mr. Sands says, crops looked promising, but already there were indications in several places of 'rust' of the leaves of young cotton plants, due to a deficiency of available potash in the soil.

The rainfall recorded at the Botanic Garden for the month was 21·27 inches; at the Experiment Station, 18·50 inches.

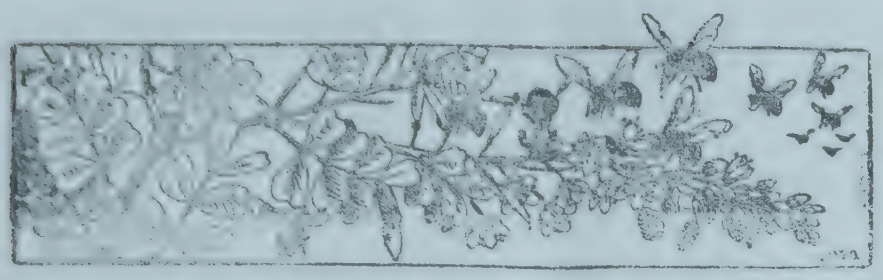
MONTSERRAT. During the month of September, plant distribution comprised 400 bay plants, 400 sweet potato cuttings, 5 lb. beans and peas, 2 dozen decorative cuttings, 106 lb. onion seed. In the Botanic Gardens three distillations of bay leaves were made, giving an average yield of 1·39 oz. per 100 lb. of leaves. The acting Curator states that in spite of the adverse weather which prevailed during certain periods of development of the cotton crop, more seed-cotton per acre has been reaped from the first crop up to the end of September than for the same period last season. The quality of the cotton this season is also much better than last season, and the advantage of a good strain is now more clearly realized by planters. The prohibition of the exportation of cotton to the United Kingdom and to British possessions only, has been withdrawn by Proclamation, and the arrival of a steamer by which cotton will be shipped, is now awaited. The prospects of a second crop are not as promising as last season, but later rains may improve the situation. The lime trees have made a slight improvement, but have produced a very poor crop. Slight attacks of cotton worms were observed in some localities, and few cotton stainers were seen in a field near Grove Station. Mr. S. C. Harland, B.Sc., spent several days on cotton investigations in the island, and left for St. Vincent on September 14.

On September 2, a storm of moderate violence passed Montserrat travelling from a south-west direction to the north-east. The lowest barometer reading was 29·804 corrected at 5 p.m. On several other days indications of bad weather were also observed. A sharp shock of earthquake was felt at 9·30 a.m. on September 16. The rainfall for the month was 4·55 inches; for the year to date, 33·56 inches.

ANTIGUA. The following was plant distribution in September: sisal, 1,000; miscellaneous, 12; cotton seed, 156 lb.; vegetable seeds, 15 packets. Mr. Jackson states that during the last week of the month good rains fell; these were general. Previous to this, sugar-cane—especially that planted early in the season—was suffering considerably for want of moisture. The recent rains have made a considerable difference to the general appearance of this crop. Only a limited area of cotton has been planted this season, and this also has suffered on account of dry weather. Onion seed arrived during the month, and 368 lb. were distributed in Antigua and a proportion sent to other islands in the colony. Cotton stainer made its appearance during the month in certain cotton fields of the island Investigations in connexion with hard back beetles were continued. During the month 201 silk-cotton trees and five perennial wild cotton trees were destroyed. The rainfall for the month was 4·36 inches; for the year to date, 23·91 inches.

From a short report on agricultural instruction in Antigua for the month of September, appended to the foregoing items, it is gathered that cotton stainers are present in some holdings. and no effort is made by the peasants to control these. Leaf-blister mite is also present in most holdings. The reaping of the corn crop has been concluded; some peasants obtained a price of 12*s.* 6*d.* per 100 lb. on the cob, while others obtained as low as 9*s.* Consequent on good showers during the latter part of the month, the planting of sweet potatoes has been commenced.

ST. KITTS. Mr. F. R. Shepherd writes to say that during the month of September the usual routine work was carried on in the Botanic Gardens. Much watering was needed during the early part of the month but a good rain on September 22 has much improved conditions. 75 lb. of Indian corn were distributed for planting purposes. The continued dry weather during the earlier part of the month was a great set-back to the cane crop, particularly in the valley district, but the rain above referred to (from 1½ to 3 inches in the valley, and from 4 to 6 inches in the northern district) has considerably improved the general condition. Reaping is still in progress on a few estates in the north, where the making of syrup was delayed owing to lack of packages. The picking of cotton is in full swing, and the returns will be above the average. The dry weather of the past two months has been beneficial to this crop. Worms have been seen, but little if any damage done. No cotton stainers have so far been reported, and leaf-blister mite is not very prevalent. The embargo against the exportation of cotton has been removed except to foreign countries. The rainfall for the month was 3·91 inches; for the year to date, 32·74 inches.



HORSE MARMALADE.

Among the common papiliaceous weeds of the West Indies are several species of the genus Desmodium. This genus is characterized by the division of the pod into distinct segments, each enclosing one seed, and these segments separate when ripe, and fall. The pods of this genus are very often covered with hooked hairs, and this results in the segments attaching themselves to the skins of animals or the clothes of human beings passing by. It will easily be understood that this is a great advantage to the plant as to its distribution. On account of this attachment to passers-by, some of the Desmodiums are known in the Leeward Islands by the name of 'Sweetheart'. *Desmodium tortuosum*, which is one of the species met with in these islands, is highly valued in Florida under the name of 'Beggar weed' as a cover crop in citrus orchards, and experiments with it for the same purpose have been conducted in Dominica

According to Piére Duss in his valuable book 'Flora Phanerogamique des Antilles Francaises', the Desmodiums, most of which occur in pastures or by roadsides, are all valuable forage plants, readily eaten by all classes of stock.

There appeared in the July number of *Revista de Agricultura Comercio y Trabap*, the official organ of the Agricultural Department of Cuba, an article by Dr. Mario Calvino, Director of the Experiment Station, bringing to notice the value as a forage plant of another species of Desmodium, lately introduced from Brazil. This species, hitherto known as *Desmodium leiocarpum*, but now according to recent American revision of the genus, to be called *meibomia leiocarpa*, is, according to Dr. Calvino's account, of the greatest value as a forage plant for the tropics, being able to endure almost every kind of soil. It is known in Brazil as 'Mermelada de Caballo'—Horse Marmalade—on account of the avidity with which horses eat it. The photographs of the crop growing on experimental plots both in Cuba and Brazil, with which Dr. Calvino's article is illustrated, certainly show a most vigorous growth.

The following description of the plant is translated from the article referred to: 'Horse Marmalade' is a shrubby plant with a perennial root which produces erect, straight shoots, attaining a height of 12 to 15 feet, becoming more tender from below upwards to the point where the shoot begins to put forth its large trifoliate leaves. These shoots and side branches produce terminal racemes of small rosy violet flowers, which are very elegant. The pods are jointed, and each joint contains one seed.

The plant grows freely from seed—in fact, if once established, it will continue to reproduce itself abundantly in this manner. Although after the production of seed the shoots die down in winter to start again from the root in the next spring, in warm climates they last, if uncut, for several years. The young shoots when they have attained a height of about 4 or 5 feet are entirely covered with large trifoliate downy leaves.

It is stated that a crop of this plant may be cut three times a year, and that the yield is estimated at about 4 tons per acre at each cutting. This estimate is based on weights of single plants in experiment plots, and the yield calculated in kilos per hectare. Stock of all kinds are very partial to it fresh, or dried, or made into ensilage.

Dr. Calvino gives a comparative chemical analysis of *Desmodium leiocarpum* and *Medicago denticulata*, one of the lucernes, which shows a fairly equal value. The food value as given in calories in comparison with Para grass, maize leaves and stalks, and elephant grass, gives a far superior value to 'Horse marmalade.'

Besides its value as forage, *Desmodium leiocarpum* is one of the leguminosæ which produce in abundance the nitrogen-fixing tubercles on the roots. Hence it is a most valuable plant as a rotation crop

For forage the crop should be cut before flowering, when the shoots are about 4 or 5 feet high, and just when they begin to be woody at the base. A vigorous new growth will immediately begin to start from the stumps left

From the above, extracted from Dr. Calvino's article, it does not seem unreasonable that he is enthusiastic over the possibilities of this plant as a forage producer in Cuba, especially as he emphasizes the fact that it succeeds eminently well in the dry districts, and even on poor soil, which it tends to enrich. It would then seem to be a very desirable plant for at least experimental introduction into many others of these islands, especially in view of further increase here of stock raising.

WILD ANIMALS.

Several of the wild animals referred to below by a Tobago correspondent in the *Port-of-Spain Gazette* are found in many of the West Indian islands. He writes:—

There are not many wild animals in Tobago, but those that do exist are of a comparatively harmless nature. Among them may be mentioned, deer, peccary, manicous, agouti, racoon, squirrel, and a variety of rats including one which has pouches inside the jaw where in carries its food.

The deer which are of the fallow species, are to be found mostly in the Leeward district, cheifly on level lands lying at Sandy Point, where they are plentiful and do much mischief to the provision grounds. They are the progeny of some that were let loose on the island by Sir Ferderick Robinson, who when administering the Government in 1818 imported a few from the Spanish Main.

The Peccary (*Dycoteles Torquatus*) is a species of hog with short ears and a gland on the back, but having a tubercle instead of a tail. They are met with in the forest in herds. They are courageous, and have been known even simply to turn on their pursuers. Their flesh is eatable.

The Manicous (*Didelphis Nudicavdata*), an animal like the opossum is common, and is very destructive in the poultry yard. It has, like the kangaroo, a pouch wherein it is able to carry its young.

The Agouti, an Indian Cony (*Dasy Proctor Agouti*) is a pretty little animal, not unlike a Guinea pig, and is remarkably clean in its food, which, like a squirrel, it eats by holding between its two paws. When captured young it becomes easily domesticated.

The Squirrels, which are numerous, are much like the common red English Squirrel. They are destructive to cacao pods.

It may be added that in Santa Cruz (St. Criox) there is a Virginian species of deer. Deer are also common in Barbuda. Monkeys (West African) are fairly common in parts of Barbados and St. Kitts.

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co. on Sea Island cotton in the Southern States, for the week ended September 27, 1919, is as follows:—

ISLANDS. The market has remained very quiet since our last circular of the 13th inst., the only sales being two small crop lots for export at 80c. and 90c.

The receipts of new crop cotton are very small and have not been offered as yet for sale. The planters are expectant of very high prices on account of small crop in prospect, and are to-day unwilling to consent to sell odd bags, classing Fine to Fully Fine, at 72½c, f. o. b. and freight. We are inclined to think, however, that as soon as the receipts are larger we will be able to buy on a parity with prices ruling for Georgias and Floridas.

GEORGIAS AND FLORIDAS. There has continued a steady demand for the old crop cotton which is held in the country, having been carried over from the crops of 1917-18 and 1918-19, the prices ranging for Average Extra Choice from 70c. to 72c., f.o.b. and freight. The holders of this stock are showing more disposition to sell. Consequently with orders in hand admitting of buying all grades from Extra Fine to Fancy, we can buy occasionally to better advantage.

The receipts of new crop are very small, and none has been offered yet on the Savannah market.

We quote, viz. :—

Average Extra Choice, 68c. to 70c. f.o.b and freight.

The exports from Savannah for the past two weeks have been, to Rotterdam 80 bales, Northern Mills 232 bales, and from Jacksonville to Northern Mills 932 bales.

The United States Census Bureau reports cotton ginned to September 1, as follows :—

South Carolina,	none, against last year,		1 bag
Georgia	19	,, ,,	97
Florida	11	,, ,,	100
Total	30 bales		198 bales

CROP ADVICES.

Islands. We regret to have to confirm our previous report that the boll weevil has appeared very generally, and in some localities has done very serious damage. The top fruit has generally been destroyed. Consequently crop estimates are now reduced to 5,000 bales.

Georgia and Florida. The accounts from these States continue unfavourable. In consequence of much reduced acreage, and the ravages of the boll weevil, which have made their appearance generally, crop estimates of these two States are reduced, and range from 5,000 to 10,000 bales. We do not wish to commit ourselves to show low estimates. However, the total crop of all three States may not reach 20,000 bales, and will be harvested very early, there being no top crop.

Arizona. Advices from this section are very favourable. Some of our correspondents, however, think the crop may not exceed 45,000 bales. Therefore a conservative estimate of the crop to-day ranges around 50,000 bales. We quote Average No. 2 quality at 67c., landed eastern points.

ORIGIN OF SEA ISLAND COTTON.

At the meeting of the Manchester Literary and Philosophical Society held in 1830, Mr. John Kennedy, one of the two founders of the present firm of McConnel & Co., Ltd., read a letter (from which an extract is seen below), which had appeared previously in the Charleston *Courier* (South Carolina). (Date omitted).

The letter is of interest as furnishing information as to the origin, or rather the manner of introduction, of Sea Island cotton into the Southern States

Reference is first made to the earlier cultivation of short staple cotton in North America. This was carried on for domestic purposes long before the revolutionary war against England. 'Two species of the same family then existed in this country (Georgia)—the real green seed, and a low cotton resembling it in blossom—both being of a pale yellow approaching to white; one with the seed covered with fuzz, the other with fuzz only upon the end of the seed.' It is believed by the writer that the first short staple seed was introduced via England from Turkey, though he gives no authoritative reason for this statement.

In particular regard to Sea Island cotton, the writer of the letter (Thomas Spalding, of Darien, Georgia) proceeds as follows :—

'The Sea Island cotton was introduced directly from the Bahama Islands into Georgia. The revolutionary war that closed in 1783 had been a war not less of opinion and of feeling than of interest, and had torn asunder many of the relations of life, whether of blood or of friendship. England offered to the unhappy settlers of this country who had followed her standard, a home in but two of her provinces. To the provincials of the north she offered Nova Scotia, to the provincials of the south, the Bahama Islands. Many of the former inhabitants of the Carolinas and Georgia passed over from Florida to the Bahamas with their slaves. But what could they cultivate? The rocky and arid soil of those islands could not grow sugar-cane; coffee would grow, but produced no fruit. There was one plant that would grow, and that bore abundantly—it was cotton. The seed, as I have been often informed by respectable gentlemen from the Bahamas, was in the first instance procured from a small island in the West Indies, celebrated for its cotton, called Anguilla. It was therefore long after its introduction into this country called Anguilla seed.

'Cotton, as I have already stated, had taken a new value by the introduction of the spinning machine into England. The quality of the Bahama cotton was then considered among the best grown. New life and hope were imparted to a colony and a people with whom even hope itself had been almost extinct. This first success, as is natural to the human mind under whatever influence it may act, recalled the memory of the friends they had left behind them. The winter of 1786 brought several parcels of cotton seed from the Bahamas to Georgia; among them (in distinct remembrance upon my mind) was a parcel to the Governor Tatnall, of Georgia, from a near relation of his, then Surveyor General of the Bahamas; and another parcel at the same time was transmitted by Colonel Roger Kelsall, of Exuma, who was among the first, if not the very first successful growers of cotton, to my father Mr. James Spalding, then residing on St. Simon's Island, Georgia, who had been connected in business with Colonel Kelsall before the revolution. I have heard that Governor Tatnall, then a young man, gave his seed to Mr. Nicholas Turnbull, lately deceased, who cultivated it from that period successfully.

'I know my father planted his cotton seed in the spring of 1787, upon the banks of a small rice field on St. Simon's Island. The land was rich and warm, the cotton grew large and blossomed, but did not ripen to fruit; it however ratooned, or grew from the roots the following

year. The difficulty was now over, the cotton adapted itself to the climate, and every successive year from 1787 saw the long staple cotton extending itself along the shores of Georgia, and into South Carolina, when an enlightened population, then engaged in the cultivation of indigo, readily adopted it.

'All the varieties of the long staple, or at least the germ of those varieties, came from that seed ; differences of soil developed them, and differences of local situations are developing them every day. The same cotton seed planted on one field will give quite a black and a naked seed, while the same seed planted upon another field, different in soil and situation, will be prone to run into large cotton, with long boles or pods, and with seed tufted at the ends with fuzz. I should have great doubts if there is any real difference in these apparent varieties of the long staple cotton. But if there is, all who observe must know, that plants, when they have once intermingled their varieties, will require attention for a long series of years to disentangle them.

'Subsequently to 1787, as the cultivation of cotton extended and became profitable, every variety of the cotton that could be gleaned from the four quarters of the globe has been tried, but none of them but one has resulted in anything useful. Mr. James Hamilton, who formerly resided in Charleston, and who now resides in Philadelphia, was indefatigable in procuring seed, which he transmitted to his friend, Mr. Couper, of St. Simon's. Mr. Couper planted some acres of Bourbon cotton ; it grew and blossomed, but did not ripen its fruit, and perished in the water.

'Mr. Hamiliton sent a cotton from Siam ; it grew large, was of a rich purple colour, both in foliage and blossom, but perished also without ripening its fruits.

'The Nankeen cotton was introduced at an early period, the same that Mr. Secretary Crawford distributed the seed of some years back. It was abundant in produce ; the seed fuzzy, and the wool of a dirty yellow colour, which would not bring above the price of the other short staple cottons, but I know it to produce three hundredweight to the acre on Teykel Island, in Georgia.

'The kidney seed cotton, that is a cotton which produces the seed all clustered together, with a long strong staple extending from one side of the seeds, and which I believe to be the Brazilian, or Pernambuco cotton, was tried, and was the only new species upon which there could have been any hestitation, but this too was given up, because not as valuable, and not as productive.'

CACAO AND COCO-NUTS IN DOMINICA.

The yearly crop of cacao in Dominica cannot be stated with any approach to accuracy, as it is well known that a considerable amount leaves the island surreptitiously. All that can be said on this matter is that production is considerably in excess of the amount shown by official figures.

There appears to be no increase of interest in this cultivation. Apparently the planting of new areas is not contemplated at present by either planter or peasant. Without development work, the output must inevitably decline in the course of years.

The position as regards cacao showed some improvement, during 1918-19 as indicated in the figures given below.

The falling off in the exports of coco-nuts during recent years makes gloomy reading. The position in 1918 may be due, in part, to the Proclamation issued in March last, prohibiting the export of coco-nuts, except under certain conditions. This was done in the interests of the food supply. It is generally held, however, that the reduced exports are mainly due to the effects of the hurricanes of 1915 and 1916. If this is correct—and it appears to be so—it is a striking example of the aftermath of these disturbances on tropical cultivation. At the close of the year there were signs of an increase of activity in this business, but it is doubtful if the position occupied in 1914 will be quickly regained. This falling off in production in practically all the leading exports during 1918 reveals a depressing situation, and one which requires careful consideration on the part of those concerned with the interests and well-being of the island.

The shipments of cacao and coco-nuts for the period 1914-18 are given below :—

		Cacao. cwt.	Coco nuts.
1914	—	8,874	554,549
1915	—	10,810	506 360
1916	—	5,707	408,007
1917	—	3,169	133,234
1918	—	4,239	89,676

(Report on the Agricultural Department, Dominica, 1918-19.)

BUDDED LIMES.

In Dominica a section of the lime experiment station is devoted to budded limes, and the results of the experiments so far obtained are given by Mr. J. Jones, in the Report on the Agricultural Department for 1918-19. He states :—

In this section there are two plots, each $\frac{1}{4}$ acre, of common limes budded on sour orange stocks, and one plot of the same area of spineless limes on the same kind of stock. Adjoining this is a plot of ordinary seedling limes for comparison. During the past two years the trees in each section have received a small dressing of organic nitrogen at the rate of 4 cwt. per acre. One of the budded plots was grown with Tephrosia as a green dressing, the other in the usual way with weeds and grass, which was weeded occasionally ; the spineless limes had a green dressing of horse beans, and the seedling limes were clean-weeded. Now that the trees are closing in, it is proposed to discard the green dressing and apply a complete manure annually.

The results show clearly the tendency to early bearing which is characteristic of budded and grafted plants ; but whether this is an advantage in the case of limes remains to be shown. Early bearing in this case tends to arrest growth, stunts the trees, and may bring about a state of ill health unless the trees are highly manured. Generally speaking, it may be said that budding is the first step in the direction of intensive cultivation, and full advantage of its application will not be obtained unless intensive methods are applied throughout the lifetime of the plants.

The second point brought out is that a green dressing like Tephrosia, which affords a good ground cover as well as lateral protection over a period of two years or more, is very helpful to limes in their early stages.

The crop returns from the three plots of budded limes placed out in July 1914 were, in 1917-18, when between two years and nine months and three years and nine months after planting in the field, at the rate of a little over 30 barrels of fruit per acre. The following year, 1918-19, the three plots of budded trees and plot of seedling limes, making in all 1 acre in extent, yielded 84½ barrels of fruit. These are remarkable instances of early bearing.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the manner in which plants adjust themselves to soil salinity, and the manner in which they are affected by salinity. Special consideration is given to the coco-nut and the sugar-cane.

An interesting article appears on page 325, Horse Marmalade (a species of Desmodium) so-called by the Cubans on account of the relish with which the plant is eaten by horses.

A review of a recent Report on the Department of Agriculture, Trinidad, appears on page 333.

Insect Notes in this issue comprise two articles of a somewhat entertaining though instructive character on 'popular entomology.'

Mr. W. N. Sands, F.L.S.

The Agricultural Superintendent, St. Vincent, Mr. W. N. Sands, F.L.S, has resigned, and is about to leave that island, to take up the post of Assistant Economic Botanist on the staff of the Agricultural Department of the Federated Malay States.

Mr. Sands has been twenty years at work in the West Indies in connexion with agriculture. On the recommendation of the Director of the Royal Gardens, Kew, he was appointed Curator of the then recently established Botanic and Experiment Station in Antigua in 1899. He was promoted in 1904 to the position of Agricultural Superintendent in St. Vincent.

Though his stay in Antigua was comparatively short, his energy and zeal in connexion with the agricultural interests of the island are still remembered, especially in the extension of the then newly introduced cotton industry.

His work in St. Vincent for the past fifteen years has aided the development of agriculture in many varied ways. Especially are his efforts for the improvement of Cotton Cultivation, and for selection and preservation of the best variety for local employment in that island, worthy of attention. His observations on the life-history of the cotton stainer, and the work concerning its control by the destruction of its wild food-plants, have also been of great benefit to the Cotton Industry, not only in St. Vincent, but in other islands as well.

In other directions, too, Mr. Sands has materially assisted in furthering the agricultural prosperity of St. Vincent. The success of the Government Ginnery, and the Government Granary is largely due to his tactful management; and the Land Settlement Scheme, which is now working well, owes also a great deal to the way in which he handled the subject.

It may be noted that Mr. Sands has contributed several papers of much interest on various subjects to the *West Indian Bulletin.*

The record of the twenty years' service given by Mr. Sands to West Indian agriculture is one of good work, well done.

Private Land Settlement in Antigua.

The reference to this land settlement scheme as a private concern is made to distinguish it from the Government scheme already established. The private scheme has been arranged by the well-known firm, Messrs. Henckell, Du Buisson & Co., who have large central factory interests in the West Indies.

Mr. J. Jackson, Agricultural Superintendent, Antigua, is responsible for the main ideas as regards the working of the new scheme, and his suggestions have been approved by the firm mentioned above.

The land on which the peasants will be settled is situated on Tomlinson's Estate, and is between 80 and 100 acres in area. The price that will be charged per acre is between £10 and £12.

It is suggested that allottees should pay a proportion of the purchase money each year for ten years, no yearly payment to be less than one-tenth part of the purchase money. No title will be issued even if payment be made in full until ten years have expired. During this time the land must be properly worked, and cannot be alienated, let or encumbered. Installments must be paid punctually

Another suggestion is that common land should be provided for the peasants to keep their cattle on. These are important : (a) as a source of milk (to help reduce infantile mortality ; (b) as a source of manure to maintain the fertility of the allotments.

The whole scheme appears to be an excellent one. These schemes will tend to cause a contented spirit amongst the peasantry, and help to increase the labour supply and the production of sugar-cane for the factories.

Fruit Culture in Malaya.

There has recently been published, under the above title, *Bulletin No. 29* of the Department of Agriculture, Federated Malay States. This bulletin of 101 pages is capitally illustrated with reproductions of photographs. After a short preface by Mr. L Lewton-Brain, the Director of Agriculture, the author, Mr. J. N. Milsum, Superintendent of Government Plantations, Selangor and Negri Sembilan, gives very plain directions in the first part of the publication about the cultivation, propagation and improvement of orchards in Malaya. This part is certainly of value with regard to fruit culture in the tropics generally.

Mr. Milsum notices the work which has been done in the Philippines and in Hawaii in the improvement of tropical, fruit and points out the fact, which is evident to residents in the tropics, that in almost every species there are numerous varieties which differ enormously in their edible values.

The second part consists of a list with full descriptions of the kinds of fruit, either indigenous or introduced, which are at present cultivated in Malaya. This forms a very interesting section. Most of the better kinds of fruit are already well known in the West Indies, such as pine-apples and oranges, bananas and mangoes, etc. Several kinds enumerated, however, are not cultivated at present in these islands, and some of them seem worthy of introducton into local botanic gardens. For instance, *Bouea macrophylla*, known to the Malays as 'Kundangan,' is described as a tree bearing in profusion yellow fruit, of the size of a hen's egg, with thin skin, and very juicy, resembling the mango in appearance. Another tree, *Disopyros discolor*, 'Butter fruit', a congener of the American persimmon, is a handsome tree, producing abundantly bright pink fruits the size of peaches, containing when ripe a creamy pulp with the flavour of strawberries. *Landium domesticum*, 'Duku', a medium sized tree, with fruit 1½ to 2 inches in diameter, contains sweet palatable pulp surrounding two or three seeds. Seeing that these are all reproduced by seeds, it would seem comparatively easy to introduce them experimentally.

Labour and Emigration

Many British West Indian colonies, particularly the smaller ones, are feeling the effects of emigration of labour to Cuba, San Domingo and elsewhere. Large numbers of men periodically leave Barbados. That colony, however, can stand an exodus better than most of the islands, owing to its dense and prolific population.

The question of available labour has always been a difficult one in the British Virgin Islands, like Tortola. Recently, according to a report by the Acting Superintendent of Agriculture for the Leeward Islands, at least 500 labourers have departed from Tortola alone to San Domingo, while practically the whole of the able-bodied male population leave Anegada for a period of about six months to work on sugar plantations in that country. As well as this, the neighbouring United States islands attract the better type of labourer. This will be understood when it is said that in St. Thomas a good man can earn $1·00 a day compared with 40 cents a day in Tortola.

The Great Flagstaff at Kew.

In a previous issue of the *Agricultural News* (Vol. XV, No. 364, p. 124), reference was made to an announcement in *Nature* for January 6, 1916, that the Government of British Columbia had generously presented to the Royal Botanic Gardens, Kew, a magnificent spar of Douglas fir, or Oregon pine (*Abies douglasii*), to replace the old spar that was broken down in 1913, owing to decay. Some particulars of this flagstaff were also given to the time. According to *The Field* (September 6, 1919), preparations are now being made for the erection in the Royal Gardens, Kew, of this great flagstaff, which arrived in January 1916, but the erection of which had to be deferred owing to the war.

Further particulars are furnished of this staff, in a brochure published by the Agent General for British Columbia, under the title of 'How the Big British Columbia Tree Became a Flagstaff.' A dozen trees were felled, some 250 feet in length, before one without warp or blemish was secured. This was 220 feet high and 6 feet in diameter, and it was shaped into a flagstaff 215 feet long; 33 inches in diameter at the base, and twelve inches at the apex. It is quadrangular from the base up to 15 feet, octagonal for the next 140 feet, the remainder being round, and it is 'perfectly straight and true.'

The loading of this great spar on to a steamer presented some difficulty, but it was successfully accomplished by means of powerful cranes, and there was no accident of any kind until it was finally placed in the gardens at Kew, where for nearly three years it has lain by the side of its worn-out, comparatively undersized predecessor, and at the foot of the mound on which it will shortly be erected.

INSECT NOTES.

POPULAR ENTOMOLOGY.

LADY-BIRDS.

A few months ago a communicated article appeared in one of the Barbados daily papers calling attention to the value of lady-birds in the control of blights of orange trees. This article was signed, and its general tone was rather that of finding fault with the Government because the local lady-bird had not been properly utilized for keeping in check the various blights which attack the citrus trees, chiefly the lime, in Barbados.

Now, while the intention of the writer of that article was to do good, he was so uninformed that if any one had paid attention to what he had written, more harm would have been done than good. His mistakes were pointed out to him by a friend who was better informed on the subject, and an attempt was made in a second article to put the matter in a better light. Again his grasp of the subject was so faulty that the second article failed of its purpose and rather tended to confuse than to clear the issue.

As to the Barbados lady-bird, the case is this. In Barbados the term lady-bird is applied to a large showy weevil which is a very serious pest of the sugar cane, while in all other parts of the English-speaking world, the insects known as lady-bird beetles are beneficial insects. See Fig 4.

The insect which is commonly called the lady-bird in Barbados is more properly known as the root borer of the sugar-cane. The technical name of this insect is *Diaprepes abbreviatus*, Linn. For more than ten years it has been the cause of very serious injury to the growing sugar-cane in many localities, and sugar planters have experienced severe losses in crop as a result of its depredations. So serious a pest has this insect become that a Commission has been appointed by His Excellency the Governor of Barbados to enquire into the root borer disease and the means of combating it. The root borer of the sugar cane is a weevil, and weevils as a whole are injurious insects.

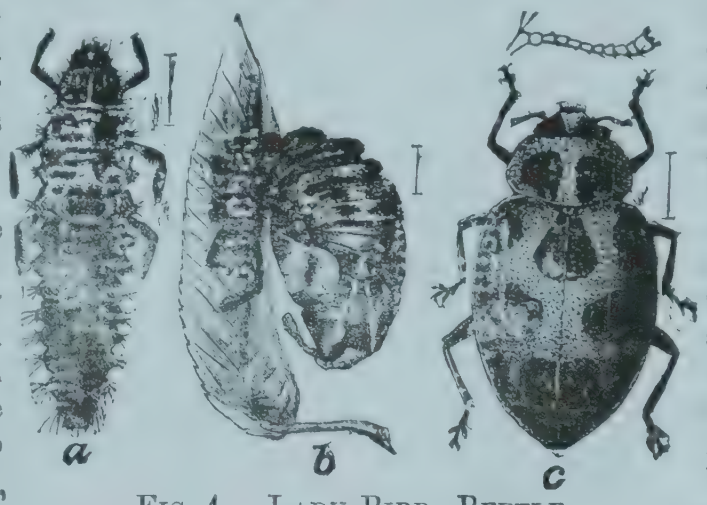


Fig 4.—Lady-Bird Beetle.
(a) Larvae, (b) Empty pupæ case, (c) Adult.

Fig 5.—The Root Borer of Sugar-Cane.

The lady-bird beetles, which are useful insects, belong to a large family of which nearly all the members are beneficial in habit. These beneficial insects do not eat plant tissues; both the larvae and adults feed upon aphides, scale insects, mealy-bugs and similar insects.

Nearly all scale insects are preyed upon by natural enemies, among which are internal insect parasites, predaceous insects, and parasitic fungi; and the scale insects which are known as blights on lime and other citrus trees in Barbados, are attacked by all three kinds of natural enemies.

The writer of the newspaper article referred to above had evidently been reading about the introduction of a lady-bird into California, and of the success which attended the attempt to control a certain insect pest by this means, and he apparently thought that a lady-bird is a lady-bird and a scale insect, is a scale insect, and that all that had to be done was to catch an insect called a lady-bird and compel it to eat some insects called scale insects.

The Cottony Cushion Scale (*Icerya purchasi*, Maskell) was accidentally introduced into California, where it became a most serious pest of orange and lemon cultivations. In Australia this insect occurred without becoming a serious pest, and it was found on investigation that it was preyed upon there by a lady bird, and it was believed that this lady-bird was responsible for keeping the Cottony Cushion Scale in check. The introduction of the Australian lady-bird (*Novis cardinalis*) into California, resulted in a natural check being put on the Cottony Cushion Scale in that State. This was not, however, a promiscuous introduction of an insect called a lady-bird, without reference to its habits, as would be inferred from the newspaper article referred to above, but the result of careful entomological investigations into the original home of the pest, and the agencies controlling it there. When its natural enemies had been found, they had to be studied as to their value in exercising a check on the increase of the pest, and it had then to be decided which one was of sufficient importance to warrant the necessary trouble and expense in the attempt to transport it from its native home, and introduce it into an entirely new environment.

As a result of this careful study into the habits and relationships of certain insects, a great effort in economic entomology was crowned with success, and a satisfactory degree of control was obtained, by natural agencies, over a serious pest.

'ENTOMOLOGY.'

A small pamphlet entitled 'Entomology', issued and distributed by the manufacturers of a certain insecticide, contains a few statements which may be of interest to readers of the *Agricultural News*.

Confusion in the use of common names of insects often leads to very considerable errors and an instance of this is given in the article 'Lady-birds' in this issue.

Inaccurate statements which arise from a lack of knowledge of biological facts, or of ordinary usage, as well as careless expression, are not only unreliable but often highly amusing.

In the following notes, extracts and quotations from the pamphlet mentioned, furnish examples of some of these points. It may be only fair, however, to state that the claims made for the insecticide are not extravagant, or perhaps it would be better to state, that the makers offer for sale a contact insecticide, and all their suggestions and recommendations indicate that they are fully aware of the limitations of such an insecticide, that is the insecticide must be brought into contact with the insect to be killed by it.

The 'Entomology' lesson begins with the heading 'Read Carefully Why and How to Kill Bugs' The reference is obviously to insects in general, not to bugs in particular, for in the United States, insects as a whole are often referred is to as bugs, and this obviously general application is to be seen in the mention of cockroaches, bed-bugs, clothes moths, carpet beetles, flies, fleas and ants, representing at least six natural orders of insects. While the use of the term bug to apply to such a wide range of different in ects is very misleading, it is not much more unsatisfactory than the extremely restricted use of the same term which is common in England and the colonies, where it usually refers only to the bed-bug, and thus the relationship of that large group of plant-feeding, sucking insects is lost to the understanding of many.

But to return to the pamphlet 'Entomology.' The following quotation indicates clearly that the writer had in mind only a certain small group of insects and not insects as a whole:—

'In the first place it is nature and instinct of nearly all forms of insect life to hide themselves, their eggs and larvae in deep, dark cracks
or crevices away from light, but near their food supply, accustomed to the dark they come out at night for food which they can find without any trouble, but if they are suddenly surprised by a light or noise, they will run and hide in these hiding places and will not come out again until everything seems safe.'

The page on Bed Bugs gives an old adage modified to suit the case 'Look before you sleep' which will appeal to many travellers, especially in the tropics. The advice in regard to the control of this insect is good—'to completely exterminate the cordially hated bed-bugs be most thorough.'

The small domestic cockroach known as the 'water bug,' 'croton bug' and 'german roach' is given credit for a social organization and a degree of perception, far beyond what would be expected in insects of this sort, and as an instance of polyembrony it is certainly a marvellous species. It is stated that each egg contains on an average thirty to forty-two 'baby water bugs.'

The social organization of the water-bug colonies is indicated in the following quotation 'A nest of this pest containing a full-fledged family do not all come out at once and place themselves liable to complete extermination to get the necessary food to live on; but part of the family comes out and after they have had all they want to eat they return, and another portion of the family appears.'

If cockroaches could reason to the extent indicated, surely the problem of controlling them would be great indeed.

The relationship between the spread of bubonic plague and the occurrence of rat fleas appears to be recognized to a certain extent, but the matter is expressed in the following lines in such a manner as to leave some doubt in the mind of the reader as to the exact state of affairs, and does not indicate the definite knowledge that exists on the subject: 'Bubonic plagues originate where there are great numbers of rats and mice that live and breed in filthy barns, ash heaps and sewers. They are covered with fleas filled with disease germs, and spread from household to household, biting and infesting the human being; hence, the plague."

The page devoted to 'Moths' contains references to a peculiar mixture of insects. The opening sentences are quoted: 'Moths are butterflies better known as Millers, from the floury coating which cover the wings and body. There are 2 kinds the Common House Moth and Buffalo Moth or Carpet Beetle. The larvae is about $\frac{1}{4}$ of an inch long, active, and covered with stiff brown hair; it feeds on nearly any kind of fabric and furs, cutting long slits and irregular holes. When disturbed it folds up its legs and antenna feigning death. The skin is cast 6 times and 2 generations of several hundred are born.'

In these statements it is difficult to make out what is referred to moth, butterfly or beetle, while the folding of the legs and attennae might refer to any of the three either as larvae or adults, while from the nature of the case this habit could only be attributed to the adult beetle.

The paragraph on Flies probably refers to the house fly but it is not so stated. The mathematical calculation involves the mind of the reader in a very long string of figures

'Flies start about April 15th with a single over winter fly; it lays 120 eggs the larvae period lasts 5 days, the pupa 5 days, or one generation 10 days, so that by September 10th, or in about 5 months, a total of 5,598,720,000,000 flies are born. Mosquitoes and flies are most dangerous insects and should be killed, as this pest breeds in swampy and filthy places, are disease carriers, and by infection, Yellow, typhoid and malarial fevers are contracted and spread.'

The paragraph on flies concludes with the definite statement that 'a dead mosquito or fly will not buzz or bite.'

A pamphlet such as the one under discussion with its jumble of facts and badly expressed statements in regard to insects may be of value in advertising a proprietary article, which in its turn may be excellent for the purposes for which it is recommended, but how much better it would be if a small amount of care were expended in order that the information contained in its pages might be accurate, well expressed, and free from ambiguity. Such a pamphlet might have an educational value: as it stands it is merely advertising matter, out of which a few readers may get a little amusement.

H.A.B.

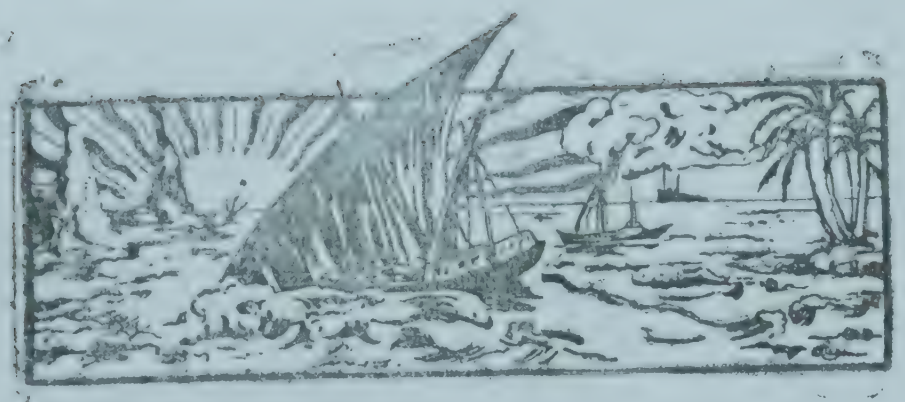
American Cotton—A cotton production of 11,016,000 bales this year, was the forecast on August 3 by the United States Department of Agriculture, basing its estimate on the conditions of the crop July 25, which it announced as 67·1 per cent. of a normal. This was an increase of 30,000 bales over forecast made a month ago, the condition of the crop showed a decline of 2·9 per cent., during the month, compared with the avarage decline of 4·2 per cent. during the period in previous years.

In a statement accompanying its forecast, the Department said boll-weevil damage to cotton probably was more widespread and serious at this time than ever before.

Heavy washing rains caused severe damage in the Carolinas, Georgia, Florida, Alabama, much of Louisiana and Mississippi and the Eastern and Southern portions of Texas.

Labour is scarce and high-priced, and acreage above the average has been abandoned.

Sea Island cotton in Georgia is being ploughed up, and little of that type will be left by the end of the season. (Washington telegram in the Jamaica *Gleaner*.)



GLEANINGS

Cuba was one of the largest exporters of sugar in the West Indies in 1810, the amount being about 33,000 tons per annum, exported to America and all parts of Northern Europe. (The *International Sugar Journal.*)

At the James Watt Centenary celebration in Birmingham last September, the visitors were shown a Watt engine which was erected in 1776, and was regularly working until 1892—116 years. Another engine dated 1796 worked continuously until 1894.

Granadilla vines will often bloom profusely, but seldom bear fruit in the ordinary way. The structure of Granadilla flowers is such as to prevent self-pollination. The remedy for this is to pollinate the flowers artificially with a camel's-hair brush.

Olaa sugar plantation in Hawaii is reported in *Facts about Sugar* for August 16, 1919, to be making good progress with its paper mulching process, and the mill is now able to turn out some paper as well for commercial purposes.

The destruction of trees by blight is causing much anxiety in the centeral districts of Jamaica. The year's orange crop will be considerably smaller than that of last year, and unless the blight is checked the industry will be seriously affected.

The Government of Martinique, French West Indies, is prepared, according to a report from Fort-de-France, to pay an annual subsidy to the Royal Mail Steam Packet Company in the event of the company agreeing to allow their steamers on the Halifax-West Indies route to call at that island.

The Imperial Trade Commissioner for the West Indies, Mr. A. J. Pavitt, has arranged to leave Trinidad, his headquarters, for British Guiana on an official visit. He hopes to visit Barbados before the close of the year, and a general tour of other islands in the Caribbean will be undertaken later. (*The Times* Trade Supplement.)

It is understood from the *Museums Journal* that it is proposed by the British Cotton Industry Research Association, Manchester, to establish a Cotton Industry Museum, having for its object the illustration of the production of cotton and its utilization in industry. (From *Nature*, August 28, 1919.)

The export of 150,000 cwt. of rice, at the rate of 50,000 cwt. per month has been sanctioned by the Government of British Guiana to the following places: Trinidad, Barbados, Leeward Islands, Windward Islands, Martinique, Guadeloupe, and French Guiana. The shipments will begin as from November 1, 1919. (The Demerara *Daily Argosy*, September 27, 1919.)

Investigations by Mr. H. C. Brill in the Philippines have indicated that the enzymes found in the Criollo and in the Forastero types of cacao are identical in character, but in general they exist in somewhat larger quantities or more active forms in the former than in the latter. None was found that was peculiar to either type. These results are dealt with at length in *Tropical Life* for August 1919.

According to the Jamaica *Gleaner* for August 16, 1919, 6 million bunches of bananas have already been shipped this year, and 4 million more will go by the end of the year provided that there are no storm disasters. The estimate for next year is 14 million bunches. It is stated that a high grade of banana is being shipped to England.

According to *Nature* for August 28, 1919, an Agricultural History Society has been established in Washington, having for its object the stimulation of interest, the promotion of study, and the facilitation of publication of researches in agricultural history. The President is Dr. R. H True, and the Secretary Treasurer, Mr. L. Carrier, both of the Bureau of Plant Industry, Washington.

A report on sisal hemp grown on Government plantations in Jamaica is published in the *Gleaner* for August 8, 1919. Four samples of sisal and henequen were stated by the Imperial Institute to be all of good appearance and quality, with the exception of a sample of henequen fibre from four-year-old plants at Litlitz plantation, which was very short, and rather inferior in strength and lustre

According to an article on the effect of sulfofication and nitrification on potassium and other soil constituents in *Soil Science* for March 1919, it has been found that nitrification of dried blood and oxidation of sulphur in soil mixtures increase the water soluble potassium. The liberation of potassium was brought about by salts formed, rather than by the direct action of acidity on insoluble potassium compounds.

Coco-nut trees at the Experiment Station, Tortola, are reported on as follows by Mr. A. E. Collens, Acting Superintendent of Agriculture for the Leeward Islands: 'The young trees are doing well and some are just commencing to bear. Coco-nuts should succeed well in the lower flats in the neighbourhood of the station. In the present cultivation several supplies are needed where failures have occurred, and this point should receive early attention.'

Botanical Bulletin No. 6, issued by the Division of Forestry of Hawaii, deals with the Hawaiian genus Kokia. It comprises twenty-two pages of figures and eight illustrations, and treats of these Hawaiian trees which are relatives of the cotton plant and some of which have already become extinct. The Bulletin describes a new variety of Kokia, recently discovered on Kauai, and bespeaks the preservation of this interesting genus by propagation, and planting. (The *Hawaiian Forester and Agriculturist* for June 1919.)

DEPARTMENT OF AGRICULTURE, TRINIDAD AND TOBAGO—ADMINISTRATION REPORT.

As the Acting Director, Mr. W. J. Freeman, notes, the year under report has been marked by a growth of the work of the Department in several directions, although there have been several vacancies on the staff owing to war conditions

The total value of the agricultural exports of the colony in 1918 was £2,835,937, as compared with £3,460,084 in 1917. This lower value seems to be attributable to the low sugar crop, this being nearly 12,000,000 lb. less than in 1917. On the other hand, the production of the other two staple crops, cacao and coco-nuts, was approximately the same in both years.

In Tobago, however, the value of exported produce exceeded that of 1917, though it did not reach the high level of that of 1916. The high prices of imported foods caused more consumption of locally grown foodstuffs in the island itself, and a similar reason is alleged for an increased local use of coco-nuts as providing substitutes for imported fats, as is also the case in Trinidad.

As an indication of the growing importance of the cacao industry, it may be mentioned that whereas in 1878, the colony exported somewhat over 10,000 000 lb. of cacao beans, in the year under review 58,638,562 lb were exported, valued at £1,547,085, though this was 11,400 000 lb. below the record year, 1917. An interesting set of experiments in converting poor-bearing cacao trees into heavy bearers by budding on to 'chupons' or suckers after the original tree has been cut back is being conducted both at River, the Government estate, and also on private properties. The results of these experiments are awaited with interest.

The short sugar crop has been noticed above. This has been attributed to the ravages of the froghopper. But reference to a report by Mr. W. Nowell, Mycologist of the Imperial Department of Agriculture, the first portion of which was published in the *Agricultural News*, May 31, 1919, and continued in the next three numbers, will show that he quite endorses an opinion of Mr. C. B. Williams, Entomologist-in-charge of Froghopper Investigations, Trinidad, quoted in the report under review, that 'there is a connexion between susceptibility to froghopper and liability to root disease.'

With regard to the coco-nut industry, it is stated that it continues to make satisfactory progress. Investigations of the troublesome disease of coco-nut trees, to be known now as 'red ring', have been conducted also by Mr. Nowell, the results of which will appear in the next issue of the *West Indian Bulletin*.

Rubber and limes are being produced in the colony on an increasing scale, though the latter industry has been handicapped by an outbreak of a fungus disease known as 'wither tip' or 'blossom blight'.

The campaign by means of lectures and publications undertaken by the Department with a view to the increase in production of locally grown foodstuffs met with well-deserved success. The small cultivators as well as the proprietors of large estates responded to the call, so that no real hardship was experienced in the matter of food supply.

There is a point of considerable interest in this report to which attention may be directed. This is the increasing number of cane farmers in Trinidad. Ten years ago they numbered just over 10,500. In 1918 the number had increased to more than 20,300. It would seem also, from the growing number of Agricultural Credit Societies and their good financial status, that the cane farmers in Trinidad are not only increasing in numbers but also in prosperity.

THE TORTOLA COTTON FACTORY.

The Report on the Agricultural Department, British Virgin Islands, for 1918-19, which is just being issued, contains some interesting statements concerning the year's work of the Government Cotton Factory at Tortola.

The Cotton Factory was opened for the purchase of cotton on October 4, 1918, and, purchasing was continued week by week till April 26, 1919, a period of thirty-one weeks.

The total weight of seed-cotton purchased during that time was 107,689 lb. On ginning this amount yielded 28,446 lb. of clean lint, or 26·5 per cent.—a rather higher yield than in some previous years.

The cotton was purchased on the profit-sharing basis. The first payment was according to quality, the highest rate being 14c. per lb.

A bonus or deferred payment system, was put into operation with the crop of 1916-17 (see Annual Report, 1916-17).

Under this system, a first payment, varying according to the state of the cotton, is made at the time the seed-cotton is sold.

Cotton so bought is dealt with in the usual manner, and, when all accounts are in, the credit balance is divided. Seventy-five per cent. is returned to the growers in the form of a bonus, or deferred payment, and 25 per cent. is retained by the Government.

There can be no doubt as to the fairness of this method of working the industry; the only question is as to its suitability to a peasantry such as we have in this Presidency.

The bonus distributed for the crop of 1916-17 was at the rate of 180 per cent. that is to say, growers received by way of bonus $1·80 for every dollar's worth of cotton they sold to the Factory. This extraordinarily high bonus was due to the fact that the seed-cotton was bought at a low first payment, and that cotton sold at very high prices later.

A bonus of 50 per cent. has been declared and paid on the crop of 1917-18. For that crop, a much higher first payment was made.

The accounts for the 1918-19 crop are not yet closed, and the amount of bonus cannot be stated.

Table showing weight and value of cotton shipped from the Government Ginnery during the last five years:—

Year.	Sea Island, lb.	Native, lb.	Estimated value, £.
1914-15	31,549	3,652	2,191
1915-16	22,750	5,569	1,941
1916-17	14,083	1,170	1,406
1917-18	10,403	2,335	1,677
1918-19	24,112	4,334	3,875

THE FUNDAMENTALS OF BOTANY.

Mr C. Stuart Gager, Director of the Brooklyn Botanic Garden, in a comparatively recent text-book on botany* strikes a new line of presentation in giving prominence to the fern plant as being the most stimulating and instructive organism for the preliminary study of life histories. After describing with the aid of excellent diagrams the alternation of generations and the reduction of the diploid cell with the haploid, he discusses some of the fundamental principles of life. He writes :—

'In the preceding paragraphs we have called attention to a number of the problems which arise from the study of so lowly an organism as a fern. Some of these have been partially solved—probably none of them has been completely solved. In fact, we may say that our ignorance of life-processes greatly exceeds our knowledge. Very much more remains to be ascertained than has already been found out; for example, what is protoplasm? Nobody really knows. We have analyzed the substance chemically, we have carefully examined and tried (but without complete success) to describe its structure. We know it is more than merely a chemical compound. It is a historical substance. A watch, as such, is not. The metal and parts of which a watch is made, have it is true a past history; but the watch comes from the hand of its maker de novo, without any past history as a watch. But not so the plant cell. It has an ancestry as a cell; its protoplasm has what we may call a physiological memory of the past. It is what it is, not merely of its present condition, but because its ancestral cells have had certain experiences. We can never understand a plant protoplast merely by studying it; we must know something of its genealogy and its past history.

'What is the origin of the sporophyte, and how did there come to be two alternating generations? What is the meaning of fertilization; what the mechanism and laws of inheritance? How did they come to be on the earth such plants as ferns? What was the origin of life? What is life? No one can give complete answers to these questions; but the purpose of the study of botany is to help fit us to seek the answers intelligently. To those who are interested in problems of this sort nothing can be more fascinating, nothing more profitable.'

Another passage of a suggestive character deals with adjustment to environment.

'By the term environment is meant all the circumstances that surround a cell, tissue, organ, or organism at any given time, or throughout its existence. The environment of tissues and organs includes surrounding tissues and organs, and the environment of cells includes the neighbouring tissues and cells. The most essential thing in the life of every plant or animal is to keep in harmony with its environment. Every change of environment necessitates an adjustment on the part of the plant in order to maintain this harmony. Adjustments are most easily made when the plant is young and plastic, and especially while it is devloping to maturity. If the amount of water in the soil is diminished, the young plant will send its roots deeper, if light is entirely cut off no chlorophyll will form. A leaf, or the prothallus of ferns, is bilaterally symmetrical because the environment is uniform on all sides; the same organs have dorso-ventral differentiation largely because the environment is unlike above and below. The motility of sperms is an adjustment to water in the environment. Thus new variations in the environment may result in different expressions of inheritance just as variations in inheritance would be followed by differences in expression, even in an unchanging environment. In order correctly to understand a plant, nothing is more necessary than to remember that its characteristics are the result, not of its inheritance alone, nor of its environment only, but of the interaction between the two.

* A brief notice was given of Mr. C. Stuart Gager's book 'The Fundamentals of Botany' in the *Agricultural News* for September 20, 1919.

INDUSTRIAL INSTRUCTION FOR GIRLS.

Attention is called in the *Journal of the Jamaica Agricultural Society* for July 1919, to the need of industrial assistance for girls in that colony, and it is suggested that this could be realized if girls of suitable attainments were made members of the Agricultural Society, or of its branches. It will be remembered that a special organization, the Girls Industrial Union, has been in existence in Barbados for many years, and has proved very successful. Perhaps this example might be followed in Jamaica. The following is what the writer in the Journal says about the present position in Jamaica :—

Day by day the question of finding suitable occupations for our young girls, by which they may earn a livelihood, grows more acute. At one time the opening for girls lay only in domestic service into which the majority were drafted. In these days the supply is much in excess of the demand, and even those who would offer work cannot afford to pay the girls decent wages (or rather a living wage).

In England and America and other industrial countries the girls get employment in factories, but as we nave no established factories to speak of for these, we are faced with the urgent question of finding congenial work for our girls.

The answer lies in the encouragement of industries that will provide work which will pay a living wage.

Of such industries, I might mention the hat, basket, and mat industries. There are women to day who are making a living from hat making. They find a ready sale for these. Institutions for girls and boys are always wanting hats. Not long ago the Instructor obtained an order for fifty hats for girls, which were supplied by some women around these parts.

This hat industry should really be a nucleus for a factory. The branch could get some of these women to instruct a class of girls in hat making, and an endeavour should be made to dispose of the hats in Kingston and other distributing centres. The parent society should be asked to help boom the industry.

The hats should be exhibited and put up for sale at all Agricultural Shows. Some should be on exhibition at the office of the Society, and at the 'Self Help' in Kingston and other town places Some could even be sent to the Toronto exhibition. The shopkeepers might be asked to stock them Then a millinery department could be established in connexion with this industry and the hats could be also dressed in all styles to please the most fastidious Jippi jappa could also be used as well as thatch for making the hats

The mat industry could be encouraged in the same way. There are girls who make mats suitable for bed side, window

blinds, carpeting and verandah awnings. If a market could be found for these, then we should have a second industry. I might mention here, that a gentleman has written to our Instructor to get him 1,000 mats for wrapping tobacco.

The wire grass straw industry is another line that needs to be encouraged. We already have persons qualified to be teachers. All we want is to find a market. That the Parent Society ought to be able to do.

Next there is the broom industry. A large amount of money leaves the island annually for brooms. We grow the broom corn used in the United States. What is there to prevent us making the brooms, and so getting some of the money that goes abroad. All we need is encouragement. The Government might be asked to encourage these industries by using some of the things we make, in their offices and institutions.

We have also the basket industry. This too can be taught to our girls, and a means of livelihood found, if we can get a steady market and Government encouragement.

We might have classes to give instruction to our girls in cooking, laundry, knitting, care of infants and sick persons, first aid to the sick, plain sewing. These will help them to fill their places in life as wives and mothers, and also fit them for employment in homes.

Castilloa Rubber.—The conclusions of the Trinidad Board of Agriculture Rubber Committee regarding Castilloa are as follows :—

1. That the planting of Castilloa as a pure crop is not profitable anywhere.

2. That the further planting of Castilloa even as shade for cacao is inadvisable, except on or near estates where it is already proved that Castilloa can be grown without injury to the Cacao crop while returning some revenue itself.

3. That where Castilloa has already been established and makes vigorous growth, it will pay to tap it.

4. That the right method of tapping Castilloa has never been found, and probably never will be found ; but that further experiment is desirable and that Merchiston method should be watched with interest.

5. That the most profitable method appears to be tapping, two or three times a year, in dry weather, with the cutlass, and collecting the rubber four days later in the form of 'scrap ball.'

6. That the cuts should be made about one foot apart, on one side of the tree only, and made obliquely upwards in order to prevent rotting due to the entry of rain.

7. That where Castilloa is alleged to injure cacao, such injury is frequently due to excessive shade, either of Castilloa alone, or of Castilloa plus immortels.

8. That, before, in such cases, condemning the Castilloa off-hand it would be well to try the effect on the cacao of the reduction of shade.

9. That the tapping of isolated Castilloa trees in certain places might be profitably conducted on similar lines to the bleeding of balata (*Journal of the Jamaica Agricultural Society*, July 1919.)

DEPARTMENT NEWS.

Mr. P. Taylor, second clerical assistant on the staff of the Imperial Department, returned to Barbados on October 9, 1919, at the conclusion of his military service abroad.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of August:—

August being the holiday month of the year, business in the Mincing Lane drug and produce markets is expected to be at a low ebb, and the present season has been no exception to the rule, but, on the contrary, to have been intensified, owing to the general labour unrest. Buyers are not only hampered by the general high prices, but also by the uncertainty of the delivery of the goods, which compels them to be satisfied by purchasing only from hand to mouth. The following are some of the chief details affecting the products in question.

Ginger began the month with a very slow demand. Sound, washed rough Cochin was scarce, the supplies offered being more or less wormy ; 790 bags of this quality were offered at auction on the 7th of the month, and 17 sold at 6?*s.* 6*d.* ; at the same auction, 646 bags of Sierre Leone were brought forward, 40 of which were sold privately at 51*s.* 6*d.*

Pimento has been in full supply at 5½*d.* to 5¾*d.* per lb. chiefly for exportation, the home demand being very small. Sarsaparilla was in good supply and fair demand at auction on the 28th of the month, when the offerings were as follows : Grey Jamaica 62 bales, 46 of which were sold at from 2*s.* 3*d.* to 2*s.* 6*d.* per lb. for mouldy, and 2*s.* 9*d.* to 2*s.* 10*d.* for part mouldy. Of the 55 bales of Lima-Jamaica, offered 6 only were sold at 2*s.* 6*d.* per lb. ; of the 63 bales of native Jamaica offered, 54 were disposed of at 1*s.* to 1*s.* 4*d.* per lb. for red and yellow.

At auction on the 30th of the month annatto seed was represented by 27 packages, but no sales were effected. Of 41 packages of Cassia Fistula offered at the same auction, only 7 were sold, at an advance of 2*s.* 6*d.* per cwt. on previous rates ; 4 bags of pods from Dominica were disposed of at 170*s.* per cwt. At the same auction on the 28th, 140 packages of West Indian tamarinds were offered but no sales were effected. Of 48 packages of East Indian also brought forward, 10 were sold at 50*s.* per cwt. At auction on the 28th of the month, kola was in good supply, being represented by 178 packages, only 44 of which found buyers ; 4 bags of fair Jamaica fetched 6½*d.* per lb., while for 16 bags of African, 7*d.* was asked.

Indo-Burma Aerial Mail Service.—The following note, taken from a recent issue of the *Journal of the Royal Society of Arts*, is interesting in view of the consideration that is being given to the question of aircraft communication in the West Indies : 'The Government of Burma recently invited the Burma Chamber of Commerce to express its views respecting the conditions under which an aerial mail service should be maintained between Burma and India. The Chamber has replied that in its opinion a service every other day between Burma and India would probably meet the present requirements, but that in order to avoid delay a subsidiary aeroplane service should be established between Rangoon and Maymyo, or such other towns as the Government may consider necessary.'

MARKET REPORTS.

London.—The West India Committee Circular, September 4.

Balata—Venezuelan Block, no quotations ; West Indian Sheet, 4*s.* 4*d.*
Beeswax—No quotations.
Cacao—Trinidad, 123*s.* to 128*s.*; Grenada, 116*s.* to 126*s.*; Jamaica, St. Lucia, St. Vincent, and Dominica, 115*s.* to 127*s.* 6*d.*
Copra—£58.
Honey—Jamaica, 70*s.* to 80*s.*
Lime Juice—Raw, 2*s.* 6*d.* and 3*s.* ; Concentrated, no quotations.
Pimento—5½*d.*
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

Barbados—Messrs. T. S. Garraway & Co., September 16.

Arrowroot—$8·00 per 100 lb.
Cacao—$22·00 to $24·00 per 100 lb.
Coco-nuts—$60·00 husked nuts.
Hay—$4·50 to $4·75 per 100 lb.
Onions—$12·00.
Peas, Split—No quotations; Canada, $8·50 to $10·00.
Potatoes—No quotations
Sugar—Embargoed.

London.—The Perfumery and Essential Oil Record, August 20, 1919.

Bay Oil—16*s.* to 17*s.*
Lime Oil—Flat, at 3*s.* 10½*d.* for West Indian distilled, and 11*s.* for hand-pressed.
Orange Oil—West Indian, 8*s.* 6*d.* to 9*s.*

Trinidad.—Messrs. Gordon, Grant & Co., July 4.

Cacao—Venezuelan, $26·00 ; Trinidad, $24·50.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 20c. per lb..
Copra—$9·00 per 100 lb.
Dhal—$10·50.
Onions—$9·00 to $9·25 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $5·00 per 100 lb.
Rice—Yellow, $12·00; to $13·00 White, $12·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., September 23.

Cacao—Caracas, 28c. ; Grenada, 24½c. to 24¾c. ; Trinidad, 24¾c. to 25c.; Jamaica, 20c.
Coco-nuts—Jamaica selects, $85·00; Trinidad $85·00; culls, Jamaica, $60·00 ; Trinidad $60·00 per M.
Coffee—Jamaica, 22c. to 26c. per lb.
Ginger—20½c. to 23c. per lb.
Goat Skins—Jamaica $1·50; Antigua and Barbados, $1·40; St. Thomas and St. Kitts, $1·50.
Grape Fruit—Jamaica, $6·00 to $6·50.
Limes—No market.
Mace—40c. per lb.
Nutmegs—19½c.
Oranges—$1·50 to $2·00.
Pimento—9¼c. per lb.
Sugar—Centrifugals, 96°, 8c.; Muscovados, 89°, 6¼c. Molasses, 89°, 6¼c. all duty paid.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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CONTENTS.

	PAGE.
Chemical Manures, West Indian Imports of	344
Coal Products, Wastage of	345
Coco-nut Cultivation in Travancore	342
Cotton Conference, The World	344
Departmental Reports	350
Douglas Fir, or Oregon Pine	342
Egg Preservative, A New	345
Eggs, How to Preserve	351
Ensilage in Jamaica	343
Fowls, Barenecked	345
Gleanings	348
Insect Notes :—	
Insect Pests in British Guiana	346
Items of Local Interest	340
Jamaica Logwood	347
Labour Supply in the Tropics	337
Mahoe Cochon Tree in Relation to the Cotton Stainer	341
Market Reports	352
Momordica Cochinchinensis	347
Nitrate, Early Application of	345
Notes and Comments	344
Papaw Fruit, Increased Size of	351
Rice Experiments in Trinidad	343
Sugar and Alcohol from the Nipah Palm	340
Sugar-cane Cultivation in Madras	341
Sugar Industry :—	
Granulated White Beet Sugar and White Plantation Cane Sugar	338
Tractor, Work of The	349

Some Aspects of Labour Supply in the Tropics.

CONSIDERING the hundreds of millions of people who live within the tropics, and the very small proportion of the area under cultivation or development, it is curious that some tropical countries should suffer from an insufficient supply of labour. British Guiana, British Honduras and the Fiji Islands are typical examples of places where the labour factor militates against development. Why should this be? Why should these places be so badly off, and other places like Barbados, Mauritius and Ceylon so well off, in respect of labour?

To indicate the extraordinary differences in population, it may be well to give a few figures. The density per square mile in British Guiana, for instance, is 3; in British Honduras it is 5; in Fiji 20; in Barbados, on the other hand, it is 1,030; in Mauritius 510: and in Ceylon 160. These figures are only approximate, but they serve to illustrate the differences that exist.

That there is a correlation between the area under cultivation in a colony and the number of the population, is evident by considering the relative degrees of development in the case of the places mentioned above. Indeed, if one considers the population in terms of density per area under cultivation, the above colonies do not differ nearly as much as they might at first be expected to do. From calculations we have made on this point, it is found that approximately in the year 1917, British Guiana had an average of 1·8 people per cultivated acre compared with 2·5 people in the case of Barbados.

If one goes into the matter thoughtfully, one realizes that countries having a good labour supply fulfill certain conditions of a very essential character. In other words, one finds a good labour supply—or what amounts to the same thing—a dense population, correlated or associated with certain inter-dependent factors. A thickly populated place is generally healthy, fertile, well-developed, and possesses good communications. All these conditions are fulfilled in the case of Barbados, Mauritius and Ceylon; they are not

all fulfilled in the case of the other three colonies mentioned.

The need of good means of communication is the great drawback to most undeveloped countries. Communications are the connecting link between labour and invested capital. In the first instance, of course, the construction of communications needs both; but once made, and given rich natural resources, these communications serve to attract far more capital and labour than were required in their construction.

A great asset to any country is a vigorous and prolific indigenous population. The Eastern tropics and parts of Africa possess this asset. It is lamentably absent in the West. In fact, development work in the entire continent of America has been almost entirely dependent upon labour introduced from other parts of the world at some time or other. British Guiana is a very striking example of this fact. The problem of that country's development would be very much simplified if it had a prolific indigenous population.

Lack of vigour is often due to prevalence of disease. Very little has been said so far concerning the health factor. Yet it is, of course, a most essential one to consider. Infantile mortality, malaria and other diseases are largely responsible for slow increases in the populations of certain countries, or rather of certain areas in those countries. Moreover, tropical diseases like malaria, venereal, and hook-worm, when they do not actually cause mortality, always exert a most lowering effect, and reduce efficiency. The vigour of the labourer of Barbados is undoubtedly due in part, to the absence of malaria in that colony. One of the problems of an efficient labour supply is the elimination, or at any rate the reduction, of disease.

It has been shown that a healthy climate, good communications, and the investment of capital will tend to attract labour. This will not occur, however, unless the scale of wages offered is high enough to form a sufficient inducement; nor will labour be attracted unless there is some guarantee of continuous employment under decent conditions of living. Cuba has succeeded in obtaining outside labour entirely by offering high wages, and employment by contract. A move in the right direction was the establishment recently of a labour bureau in British Guiana.

A successful method of increasing the labour supply is through land settlement. Land settlement leads to the formation of permanent communities composed of families. Increase in population is thereby stimulated. In some places where big central sugar factories have been established, the estates have been cut up into small holdings. On them the labourers grow their own cane and sell to the factory. The labourer therefore is his own master. Yet he works for the good of the factory just as much as if he were an employee. This system, under proper supervision, such as it gets in Trinidad, is an excellent one, and a very sound solution of the labour supply problem under certain conditions.

The most obvious solution to the problem of an inadequate labour supply is organized immigration—indentured labour. This matter, however, has political aspects, and is not as simple as it at first appears to be. The supply of indentured labour from India to the West Indies has been stopped. In the past it has proved successful, and on it British Guiana has depended for its development. Whether it will be resumed, or whether other sources of labour will be tapped, are questions that have been engaging the attention of the authorities for some time. Certain things are clear, however. Provided countries awaiting development have resources, capital, communications, and a bearable climate, they will attract labour, always provided the scale of wages is reasonably high in proportion to the cost and comfort of living.

SUGAR INDUSTRY.

GRANULATED WHITE BEET SUGAR AND WHITE PLANTATION CANE SUGAR.

Attention was drawn in the *Agricultural News*, January 11, 1919, to certain difficulties stated to have been experienced by some British confectioners in the use of cane sugar in place of beet sugar. The article referred to concluded by remarking that mere declamation or the assertion of the merit of one kind of sugar as contrasted with another will not suffice; the matter should be thoroughly and carefully investigated.

In the *International Sugar Journal*, May 1919, an instructive article on the subject appears from the pen of Dr. H. C. Prinsen Geerligs, the well-known sugar expert. This article throws much light on the difference existing between the two sugars, and suggests remedies whereby white plantation cane sugar may be rendered suitable for use in the very same way as the German and Austrian beet sugars were used before the war.

In discussing the difference between washed beet sugars and washed cane sugars, Dr. Prinsen Geerligs refers to the well-known fact, that almost the sole constituent of the two sugars, namely sucrose, is the identical chemical body both in cane and in beet sugar. The difference must be found in the very small amount of

impurities or admixtures prevailing in or around the crystals. This difference may be due, first, to the difference in the nature of the constituents other than sucrose in the juice of the raw materials; or, in the second place, to the different methods of manufacture to which the juices have been submitted in order to produce the sugar.

All cane juice contains reducing sugar, commonly known as glucose. Sound beet juice, on the contrary, does not contain any glucose, or such a slight percentage that it is destroyed during the boiling with lime, so that the syrup is practically free from glucose. All the other bodies, as gums, mineral matter, caramel, etc., are found in both syrups. On crystallization of sugar the sucrose particles arrange themselves in the shape of lamellae, which together build up the crystal, but include very minute portions of the syrup. If therefore the syrup contains glucose, the crystals will keep included between the lamellae, a small quantity of glucose which can not be removed by washing. For this reason the very best white plantation cane sugar always contains a very small amount of glucose, while granulated beet sugar, which is crystallized out of a syrup which did not contain any glucose, is free from that constituent.

For common use, and for ordinary confectionery, the small amount of glucose present will not cause any trouble. This is asserted after investigations this year by a confectionery firm in Holland. But the same confectioners state, that white plantation cane sugar lacks the necessary firmness for the concoction of certain kinds of candy, so as to keep dry and hard after exposure to moist air.

The second difference between beet and cane sugar is due to the methods of manufacture. The juices from which beet sugar crystallizes are repeatedly filtered through cloths, after the raw juice has been submitted to a very effective clarification with lime, followed by a saturation with carbonic, and sometimes also with sulphurous, acid. The syrup also coming out of the evaporators again passes through filters, and in most cases also, the first molasses before it is added to the mass cuite in the vacuum pan The syrup therefore is quite clear, and does not contain any substances which might be incorporated in the crystal and spoil its lustre.

In cane sugar manufacture, however, in most cases the juice is treated with a small amount of lime and sulphurous acid, and only the bottom part or scums which remain are filtered; even if the clear juice passes through some kind of filter, the filtering medium must be so coarse as to allow filtration of the juice, so that a great deal of colloidal and slimy matter necessarily passes over into the syrup. This therefore is not properly filtered, and is only clarified by renewed subsidence and decantation. The syrup from which the cane sugar crystallizes out is therefore not clear, and the lamellae of the resulting crystals may include slimy matter, specks of dirt, etc., which cannot be removed by washing, and remain in the finished product.

Dr. Prinsen Geerligs suggests the employment of improved clarifying processes in the manufacture of cane sugar, and refers especially to the carbonitation process, and the process of Bach with liming and saturation of the syrup. With the carbonitation process the juice is treated just as beet juice is, and is thereby rid of every trace of silica, slime, gum, etc.; while in Bach's process the syrup is limed and saturated in such a manner that a thick precipitate forms, and leaves a syrup that will filter through cloth. The sugar crystallizing from such a well-filtered and clear syrup will not differ, save for the small amount of glucose referred to above, from granulated beet sugar.

Most manufacturers of confectionery do not so much need a colourless sugar solution, but require brilliancy and clearness. In fact, the requirement for the sugar to be used by the confectionery trade, is that it yields a solution which is either colourless or only slightly tinged, but in any case, one which is absolutely clear.

Many British manufacturers of confectionery have extensively used a simple device for treating plantation white cane sugar, which enables them to obtain that article in a condition to suit their purpose without having recourse to the costly process of refining. Most confectioners use sugar in solution only, so that the aim is to obtain a clear thick syrup. To that end they may use a solution of white plantation cane sugar of 60° to 70° Brix, and mix that with the vegetable charcoal, 'Norit,' in a mixer provided with a steam coil. Some 6 per cent. of the charcoal is used, and the mixture, kept in motion by a stirring device, is heated to 90° C., and afterwards pumped through a filter-press lined with finely woven filter cloth. The first portions of the filtrate are more or less cloudy, and are run back to the mixing tank, but after a few minutes the sugar solution comes out of the press in a colourless and bright state. The expense of this process is very much less than that of real refining, and allows an extensive use of cane plantation sugars. Some confectioners, for instance, chocolate manufacturers, require the greater part of their sugar in the shape of a fine white powder, and not as a thick syrup. This is obtained from the thick syrup prepared as above, by a process whereby the syrup is deprived of its moisture content, and is beaten into a mass of impalpable powder. As the whole of the sugar is thus converted into powder, there is no formation of molasses, but only a disintegration of the crystallized sugar to the form desired by the chocolate manufacturer.

It is therefore feasible, Dr. Prinsen Geerligs states, to obtain every kind of sugar fit for the manufacture of the choicest jams, chocolates, condensed milk, mineral waters, candies, etc., from white plantation cane sugar, without any refining process, properly speaking, but with the aid of simple devices which remove the slimy substances now present in most white plantation cane sugars.

If the manufacture of these cane sugars is improved in such a way that the whole of the juice or syrup can be filtered through cloth before the sugar is allowed to crystallize, it would be quite possible to use them even without those eliminating devices mentioned above, for the very same purposes as German and Austrian beet sugar was used before the war.

Mr T. Jackson, Agricultural Superintendent, Antigua, has been offered, and has accepted, the higher post of Agricultural Superintendent, St Vincent, in place of Mr. W. N. Sands, recently promoted to the Federated Malay States. Mr. Jackson has for many years carried out very useful work in Antigua connected with sugar-cane experiments, and with cotton, and especially with matters concerning the co operative movement. He is therefore well fitted to carry on the similar, though rather more specialized, work involved in the appointment at St. Vincent

Mr. Jackson is expected to leave Antigua for St. Vincent on November 9, 1919.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. Plant distribution during the month of September comprised, 4 grafted mango plants, 2,350 shade tree cuttings (Gliricidia), and 221 decorative plants. In the Botanic Gardens 432 coco-nuts of a good variety were sown for sale to planters. Routine work in the Gardens was continued. The Agricultural Superintendent, Mr. W. N. Sands, states, in regard to staple crops, that with good weather they made satisfactory progress, and their condition was up to the average. The acceptance by this officer of the post of Assistant Economic Botanist in the Federated Malay States is recorded. The rainfall for the month at the Botanic Gardens was 8·75 inches; at the Experiment Station 8·86 inches were registered.

GRENADA. From notes forwarded by Mr. J. C. Moore, Superintendent of Agriculture, for the months of August and September, it is gathered that the routine work of the Botanic Gardens has been maintained. Plant distribution was as follows: cacao, 80; limes, 400; budded oranges and grape fruit, 31; grafted mangoes, 18; ornamental, 48; horse beans, 50lb.; large white Lima beans, 2 packets; *Crotalaria juncea*, 2 packets; St. Vincent castor oil seed, 6 pints; onion seedlings, 186; onion seed, 4lb. 5 oz.; grape, 1; other economic plants, 42. The condition of the staple crops, Mr. Moore says, might be regarded as fair. Cacao picking in many sections has begun, and the prospects appear better than those of last year. Recent rains have been very favourable The Marie Galante cotton crop in Carriacou, taken as a whole, promises to be early. The interplanted corn is somewhat poor, due to lateness in planting, lack of cultivation, and neglect of seed selection. Thrips, while present, do not appear to be as destructive as they were at the same period last year. Regarding pests, the cotton worm and sugar-cane moth borer are said to be present in Carriacou. Measures for their control have been recommended to the peasantry. The Superintendent of Agriculture lectured and gave demonstrations on the cultivation of onions in the parishes of St. George, St. John, and St. David. Some of these meetings were well attended, and keenness in the cultivation was manifested. August was a decidedly wet month. The rainfall at Richmond Hill was 15·10 inches. September was wet and hot: Richmond Hill recorded 11·05 inches of rain.

ST LUCIA. Mr. A. J. Brooks, Agricultural Superintendent, writes to say that plant distribution is suffering considerably, due to the withdrawal of coasting steamers. Distribution during the month of September included: limes, 500; mango 'Julie,' 18; ornamental plants, 40; economic, 2; orchids, 2; grape fruit, 12; Gliricidia cuttings, 142; rice, 36 lb.; vegetable seeds, 60 packets. Regarding staple crops, the reaping of cacao had commenced, the lime crop was slackening, while sugar-cane was maintaining good growth. Prof. J. Chester Bradley, M.Sc., Ph.D., F.E.S., of Cornell University, who is on an entomological expedition to South America, paid a visit to St. Lucia, remaining thirteen days on the island. The Castries office was placed at his disposal during his stay, and the Agricultural Assistant accompanied him on tours in the country districts. Lectures on agricultural science were given in some of the primary schools by agricultural officers. The rainfall for the month recorded at the Botanic Gardens, Castries, was 8·94 inches; at Choiseul, the record was 7·40 inches.

DOMINICA. Mr. Joseph Jones, the Curator, in notes forwarded to this Office, states that during the month of September 10,000 lime seedlings were transplanted inthe Experiment Stations. In the lime experiment station the crop during the month was 151 barrels of limes, making a total of 625 barrels of fruit for six months. Plant distribution was as follows: limes, 1,475; vanilla, 600; cacao, 25; Washington Navel orange, 16; miscellaneous, 35; shade tree cuttings, 500; vegetable seeds, 95 packets; onion seed, 60 lb. The local price for ripe limes has risen from 6*s*. to 7*s*. per barrel. Raw lime juice remains at 10*d*. per gallon. The latest cable quotations for concentrated lime juice was £35 per pipe, showing a drop of £5. The price for cured cacao dropped from 9*d*. to 8*d*. per lb. A considerable amount of blight on lime trees is reported from several districts. The weather was normal. The rainfall for the month was 7·06 inches.

SUGAR AND ALCOHOL FROM THE NIPAH PALM.

The Nipah palm (*Nipa fruticans*), is one of the very few tropical plants which occur in pure stands over extensive areas in Borneo. In common with many other palms, its sap contains sugar, and laboratory experiments conducted at the Bureau of Science, Manila, indicate that production of sugar from Nipah palm sap would be a commercial success. According to these experiments, it is estimated that there would be at least 12 per cent. of recoverable sugar in the sap, and the average annual yield of 4,000 gallons of sap per acre of Nipah under management should produce about 4,000 lb. of sugar.

Although the production of sugar from the Nipah sap is still in the experimental stage, the manufacture of alcohol from the same source is a well-established industry. For many years the natives of the Philippines have been producing a low grade distillate averaging about 25 per cent. alcohol, which has been used as a beverage. Lately the crude stills which produced this distillate have largely been replaced by modern distilleries, of which seventy-five were in operation in 1913. These produced 2½ million gallons of distilled spirits. Over 98 per cent. of this production is diluted and used for beverages, and the balance utilized as fuel for lamps, stoves and motors.

The Nipah palm grows in dense formation on tidal areas throughout all of the Eastern tropics. Very extensive areas are to be found in Borneo, and the British North Borneo Government estimate that at least 300,000 acres exist at very accessible points throughout their territory. One block of 57,000 acres has already been surveyed on the West Coast, and certainly another 100,000 acres can be reached within four hours by launch from Sandakan on the East Coast, and the same can be said as regards Tawau on the East Coast, but further south. *Bulletin No. 3* of the Department of Forestry, British North Borneo, discusses the possibilities of establishing this industry in Borneo. —(*The Board of Trade Journal*, August 7, 1919.)

THE MAHOE COCHON TREE IN RELATION TO THE COTTON STAINER.

In the *Agricultural News* for May 17, 1919, there were published some notes by Mr. W. N. Sands, then the Agricultural Superintendent, St. Vincent, on the 'Mahoe Cochon' or 'dobarubois' tree (*Sterculia caribaea*), as a food-plant of the cotton stainer. Mr. Sands has recently forwarded an account of further investigations in this subject, made, under his direction, by Mr. F. A. Simmons, Foreman at the Experiment Station, St. Vincent. These investigations seem completely to establish the opinion expressed in the former notes referred to above, that under present conditions of cotton cultivation in that island, and with regard to the situation in which the 'Mahoe Cochon' trees grow, instead of being a danger to the crop as a food-plant for the stainer, they act as a trap for the insect, leading it to be destroyed by the attacks of the chinch bug fungus (*Sporotrichum globuliferum*).

After his first investigation, Mr Sands arranged with the owner of the Owia estate in the northern part of St. Vincent, where the Mahoe trees grow in the forest, to plant a field in cotton in the month of July for experimental observation. This was done, and towards the end of September careful study of the field was undertaken by Mr. Simmons, who reports as follows :—

'I examined all the cotton planted at Owia, which consisted in great part of plants in the bolling and flowering stages. I also inspected many plots of similar cotton belonging to small holders at Sandy Bay, which is adjacent to Owia, and included in the area that is likely to be infested by the pest from the "Mahoe Cochon" trees. Not a single individual of the pest was discovered in the plots examined, and enquiries made resulted in a few cases being cited where a few of the insects were seen during the first weeding of the crop, but none since.

'The result of this visit now makes it possible to say whether the "dobarubois" tree is a menace to the cotton industry of the island. The condition existing in the cotton area in the vicinity of the tree is equal to that obtaining in other areas about the island, and, as the investigations have shown, it is better than in certain cases. The history of the case brought up to date is as follows. The pods of the "dobarubois" trees burst, and allow the seeds to fall on the ground during the month of April. From this time onward to the end of July, stainers which have migrated from the cotton fields feed on the seeds. This source of sustenance fails them at the end of that time, owing to the seeds having rotted or germinated. They then appeared on guava bushes on a bit of uncultivated land in the near vicinity, their numbers being thinned meanwhile by a fungus disease which had been contracted in the humid conditions of the forest where the "bobarubois" trees grow. The cotton in the neighbourhood at that time had not attained the flowering stage, and therefore afforded them no sustenance. The likelihood of survivors infesting the cotton plots when the flowering stage had been reached, has not been borne out.

'As the stainers on the guava bushes were not collected, one of two things may have happened : (1) they may have migrated to the cotton fields at Mount Bentinck estate, about 10 miles distant which had first started flowering, or (2) they may have gradually died out owing to the double hardship of uncongenial food and disease. At the time mentioned, and since then, stainers have been collected on the estate named, but their occurrence has been of a sporadic nature, and not of a sudden and large infestation so characteristic of stainers migrating from areas where the food-supply had suddenly given out. Moreover, the insect, as noted at the time, appeared weak and incapable of long flights. The alternative would appear, therefore, to have been their fate.

'From the history of the case it could be seen, however, that if cotton be planted at Owia or Sandy Bay early in the month of May, the plants would be directly infested by stainers when they start flowering in the month of July.'

SUGAR-CANE CULTIVATION IN MADRAS.

The Director of Agriculture, Bombay, writes as follows in his report for 1917-18 on the present satisfactory position of cane cultivation in that State:—

In previous reports I have referred to the work on sugar-cane that has been done by the Department, and I wish to refer to it again. The Manjri Farm is in a high state of efficiency and doing excellent work; the Gokak Farm has steadily improved of late years under physical conditions of considerable difficulty; and the new farm at Saval-vihir (Godavari Canal) has now on it the finest crop on the canal, which is saying a good deal with regard to a tract where some of the cultivators grow remarkably heavy crops; and at Ratnagiri and Rumpto a good start in cane growing has been made. Much progress has been made in the trial of new varieties of cane, in cultural and manurial methods, and in gur making. There has been a large increase in cane growing during the past few years, and a large number of the cane growers are amongst the best of the cultivators that we have. It is satisfactory to record that they have largely appreciated and taken up the methods that we advocate, green manuring with *sunn*, the application of nitrogenous top dressings, the planting of tops only, cultiation in straight lines, which greatly reduces the consumption of water, keeps the soil open and reduces the cost of tillage, and the employment of economical furnaces and precise methods for gur making. It is common now to find cane growers, even in remote parts of the Presidency, trying our new varieties of cane and adopting our methods of cultivation In the Poona and Sholapur Districts the Manjri methods have now been adopted so widely that they are known to every one, and in other districts they are spreading rapidly. A great factor in popularizing these improvements has been the short course which is held for cultivators every year on the Manjri Farm, and which is each year becoming more popular. I found a man in the Sholapur District who had attended this course, and fully appreciated the opening for profit that exists. By the adoption of our methods he was economising water to such an extent that he was growing 7 acres of cane on the water provided by one *mhot*, as against the $2\frac{1}{2}$ acres of cane which the ordinary cultivator can grow with such a water-supply; and although 7 acres was too large an area for one *mhot* in a very dry year like the present, the greater part of his crop was in excellent condition, and he was confident that he could easily grow 5 acres on the water-supply available. We have some remarkably good cane growers in the Deccan; but it must be admitted that on our canals the general level of cane cultivation leaves much to be desired. This, in my opinion, is mainly due to economic causes; and it is a matter for great regret that the country is not getting the full benefit from these canals which it should get.

CULTIVATION OF THE COCO-NUT IN TRAVANCORE.

'Devavriksham' (the tree of heaven) is the name which has been ascribed to the coco nut palm in ancient Indian literature, and according to Dr. N. Kunjan Pillai, Director of Agriculture and Fisheries, Travancore, well does it deserve that name in India, especially in Travancore There the coco-nut tree is the principal source of financial wealth and revenue, and it supplies also many, if not nearly all, of the domestic requirements of the people.

In a country where the coco-nut palm is of such great economic importance, one might easily expect to find a proportionate amount of interest taken in its cultivation. Thanks to the work of the Agricultural Department directed by Dr. Pillai, such interest has been evoked, and some of the practices followed in regard to the palm culture there are worthy of the careful notice of coco-nut planters in other parts of the world.

A full account of the industry in Travancore will be found in the *Agricultural Journal of India*, Vol. XIV, Part 4, in a paper by Dr. Pillai, read at the Fifth Indian Science Congress, Lahore, 1918.

According to this paper, among the varieties of coco-nut met with in Travancore, as many as forty have been counted. They differ from one another in various ways, including thickness of the kernel, oil-content, and period of maturity of the palm. Under normal conditions, it is said, some varieties begin to bear in three or four years, and others in seven to eight years, and on this distinction the coco-nuts can be classified as early and late varieties. The life of early varieties is not more than twenty to twenty-five years, while the late varieties may live up to 100 years or more. The ideal variety, as Dr. Pillai points out, is the tree which has the longest life, which produces medium-sized nuts having a thin fibrous covering, thick kernel, and high oil-content. Active steps have been taken to increase the distribution of strains having these characteristics.

In Travancore, seed nuts are usually collected from middle-aged palms. The nuts which ripen in the dry months are considered to be the best for seed. In harvesting the seed nuts, some cultivators take great care, as they should do, to prevent injuries to the embryo. Before planting in specially prepared nurseries, the seeds are stored for a couple of months and allowed to lose a considerable proportion of the milk inside.

The nuts germinate in two months, and are transplanted at one year old. On lowlands, which are subject to inundations, experience has taught the ryots that it is better to plant two-year-old seedlings. On laterite soils, also, where there is trouble from white-ants, it is said to be advisable to plant two-year-old seedlings only. It may be pointed out in connexion with this time for transplanting, that the custom in many coco-nut countries is to do it earlier, when the seedlings are about six months old. It is usually found that young seedlings establish themselves quicker than older ones. But at any rate it is interesting to learn that the transplanting of older seedlings is satisfactory in Travancore.

On lands subject to water-logging, the seedlings are planted on ridges 2 feet above the water-level. On elevated lands where the soil is inclined to be hard, the seedlings are planted in pots as big as 4 cubic feet, of which 2 feet are filled with surface soil and manure.

In Travancore it is invariably the custom to grow catch-crops with young coco-nut palms. If plants like cassava and banana are grown, they should always be manured; green dressings, on the other hand, do not demand manuring.

In general the cultivators in Travancore have certain well-marked practices which may be briefly but comprehensively stated as follows: (1) addition of silt to sandy soils and sand to clay soils to correct the physical defects of the soil; (2) the terracing of slopes to prevent surface washing; (3) careful collection and selection of seed nuts; (4) application of ash and common salt to the soil before transplanting, to prevent attacks by white-ants; (5) planting of two-year-old seedlings on lands subject to inundation, and on hilly land where there is white-ant trouble; (6) the cultivation of catch-crops for the first four or five years; (7) application of ash and common salt to the crown of the palm as a preventive against the attack of beetles; (8) and last, but not least, the practice of making beds around the palms in June, and of filling them up and digging the whole ground in December in order to collect and conserve as much as possible the rain-water, and utilize it to the maximum benefit of the plantation.

The coco-nut palm, we know, everywhere requires a well-drained and light-textured soil. But it also requires water, and, as well, plant food. The coco-nut cultivations in Travancore suffer considerably from lack of mineral food. Owing to the expense and scarcity of chemical manures Dr. Pillai has invented a mixture composed of locally produced ingredients as a substitute, and this is as follows: oil cake 10 lb., ash (composition not stated) 20 lb., fish refuse 2 lb., common salt 1 lb., per tree.

Such a mixture, which has the following composition, N. 0·53 per cent., phosphoric acid 1·01 per cent. potash 0·74 per cent., could be easily produced in the West Indies and other parts of the tropics. The average annual yield of the trees in Travancore is stated to work out at only about thirty nuts; but there is definite evidence to show already that manurial treatment will cause this production number to be doubled. The need of manuring, therefore, is one of the chief things requiring attention at the present time in connexion with Travancore coco-nuts.

There is one point in these Indian practices referred to above which calls for comment, and that is the implied contention amongst the growers, that common salt is necessary for the satisfactory growth of the coco-nut. In fact, Dr. Pillai himself says, 'Near the coast, where there is the possibility of the subsoil being infiltrated with brackish water, the application of common salt can be dispensed with; but in other places *it is indispensable*.' [Italics are ours.] This statement is in direct opposition to the opinion of Dr. Copeland, in the Philippines, and of other people well familiar with the requirements of the coco-nut palm.

THE DOUGLAS FIR, OR OREGON PINE.

The following particulars in connexion with this tree, from which the new giant flagstaff in course of erection at the Royal Botanic Gardens, Kew, referred to in the last issue of the *Agricultural News*, is made, are published in a recent issue of *The Field*:—

'The Douglas fir, or Oregon pine (*Abies Douglasii*) is the most important timber tree in North America. It is found from North British Columbia to Mexico, often occurring in pure forests over vast areas. "No other tree combines such great individual sizes, such excellence of quality, or such vastness of quantity over so wide a range." It reaches its maximum development in Southern British Columbia, where its height is from 150 feet to 250 feet, with a diameter from

3 feet to 6 feet. The wood of Douglas fir is the strongest in the world for its weight, obtainable in commercial sizes and quantities. It is now recognized in the world's markets as the best of all large construction timbers. Quantities are shipped to the United Kingdom, the continent of Europe, South Africa, India, China, Australia, New Zealand, and South America. It is obtainable in the largest sizes required, but the greater portion of Douglas fir dimension is, of course, manufactured and used in the smaller commercial sizes. Douglas fir is the largest structural timber growing in Canada or the United States. Its usefulness, however, is by no means confined to structural work, as the wood is most suitable for interior finish work, and is used to an enormous extent on the North American continent for this purpose. Douglas fir is probably the most useful of all soft woods grown, its suitability giving it a very wide range of uses. It is used for shipbuilding, beams, columns, posts, bridgework, railway ties, rafters, flooring, matchings, doors, mouldings, etc. Size for size it is the equal in strength of long leaf Southern pine (pitch pine), but has about 25 per cent. less weight than pitch pine. It is exported unplaned for joists, studding, rafter, and heavy timbers, and planed as flooring, matching and the like. All planed material manufactured for interior finish is kiln-dried before shipment. This wood is moderately hard, but easy to work, straight-grained, tough, resilient, and durable.

'The imports of Douglas fir timber into the United Kingdom were, in 1915, thirty-eight million feet; 1916, twenty million feet; 1917, thirteen and a half million feet. Usually it is imported in large or "merchantable" sizes, to be resawn here. It has been largely used for railway sleepers, and after having been laid for over seventeen years on the Great Western Railway, out of 1,616 sleepers only twenty-three had been removed on account of decay. There is further proof of the durability of this wood in the fact that a spar of it had stood exposed to all weathers as a flagstaff in the Royal Gardens, Kew, for over fifty years.'

Good Ensilage in Jamaica.—An experiment in the making of ensilage at the Hope Farm has been in operation now for eight years, and the results have been completely satisfactory.

The plant consists of two stave silos, size 12 feet by 30 feet, holding 60 tons each, a Massey-Harris 'Blizzard' Cutter and Blower, which will cut up 3 to 4 tons of forage per hour and blow it into the silo from the delivery pipe of the blower, and a 20 h.p. gasolene engine.

One gallon of gasolene costing 2*s.* 8*d* is consumed for each 3 tons of forage cut up.

Guinea corn in the ear and Guinea grass just arrowing were employed for making the ensilage, and an excellent product resulted. Visitors from the United States gave the opinion that our silage was superior to the average corn silage used in that country.

It has now been demonstrated that, by making ensilage, it is possible on the Liguanea Plain without irrigation to secure a constant supply of succulent forage, and that the produce in the form of either Guinea grass or Guinea corn silage is a first class ensilage that is relished by cattle, and is also quite wholesome. With the grass lands at our disposal at the Farm, it is now manifest that six silos of 60 tons capacity each are required in order to deal economically and efficiently with our produce. (*Journal of the Jamaica Agricultural Society*, May 1919.)

RICE EXPERIMENTS IN TRINIDAD

Useful results have been obtained, and are likely to continue, following from the rice experiments described by Messrs. J. de Verteuil, F.I.C., and L. A. Brunton in the *Bulletin of the Department of Agriculture*, Trinidad and Tobago, Vol. XVIII, Part 2.

The experiments were started in 1914, and were first confined to a study of the comparative yield of four varieties—three from British Guiana, and the fourth, a local variety. Five years' work shows that Creole Variant 2 (from British Guiana), and Jerrahan, the local variety, are the best of the four, and may be expected to yield 20 barrels of paddy (of 120 lb.) per acre in a normal season.

In 1917 experiments were started to test the influence on yield of early and late preparation of the soil. With one exception, it was found that an increase of 1·9 to 6·8 bags of paddy per acre may be expected in favour of the early preparation of the land.

Distance planting experiments have also been conducted during the last two years. The best results were obtained from plots planted at between 9 and 12 inches; 10 inches apart is probably the best planting distance.

With a view of ascertaining the smallest number of plants that may be put to a hole when transplanting from the nurseries, so as to plant up the largest area possible with the smallest number of plants, experiments were carried out, which have given definite results. It is not uncommon to see growers plant out a handful of seedlings containing probably ten to fifteen plants, in a hole. The experiments, however, have shown that five plants to the hole give the highest yield, owing to the fact that, with fewer plants, tillering is greatly encouraged, and there must also be much less competition. It is probable that two to four plants per hole would, in most conditions, be quite enough.

These useful experiments have included recently, the testing of varieties of rice imported from the East—from Ceylon, India, Java and Formosa; also new varieties from Demerara, Louisiana and British Honduras. The Ceylon varieties gave very good yields, but the writers appear to think most highly of Demerara varieties, 75 Strain 2, and Creole Strain 2.

The paddy from British Honduras did not germinate.

Lastly, the important work of seed selection has been started in Trinidad. The second year's work has shown that not only has a larger average number of tillers per plant been obtained, but also a larger yield from the best plant, and from the average of fifty selected plants. It is hoped that by continuing the selection of the best plant yearly, a strain or strains of rice may be produced which will give much larger crops of paddy than are now obtained.

In a paper on sugar-cane varieties and froghopper blight in Trinidad, by Mr. C. B. Williams, Entomologist in charge of Froghopper Investigations, the situation is summed up as follows: No variety of cane at present grown in Trinidad is immune from disease. Uba and Badilla are more resistant than the rest, and the following recently introduced canes seem worthy of more extended trial, namely Ba.6032, B.H.10(12), White Tanna, and H.(?). The evidence shows that there is considerable variation in resistance, and attention should be paid to this point, particularly in connexion with raising new varieties from seed in Trinidad.

EDITORIAL NOTICES.

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The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with various aspects of the labour-supply problem in certain tropical colonies.

The reasons why white plantation cane sugar is objected to by preserve manufacturers are explained in an article on pages 338 and 339.

Important results concerning the relation of the Mahoe Cochon tree to the cotton stainer in St. Vincent will be found on page 341.

An article on the cultivation of the coco-nut in India appears on page 342.

Insect Notes in this issue review work done recently on the insect pests of crops in British Guiana.

West Indian Imports of Chemical Manures.

Reference to the Blue-books of the different West Indian colonies will provide interesting information concerning the quantity and value of the imports of chemical manures into the West Indies during recent years. Here are figures for British Guiana :—

Year.	Amount, tons.	Value, $.
1915	13,822	746,035
1916	14,661	935,753
1918	7,428	1,028,633

Thus approximately half the quantity was worth double the value in 1918 as compared with 1915.

In regard to Barbados, in 1917 there were imported 822 tons of nitrate of soda valued at $47,347, and 4,804 tons of sulphate of ammonia valued at $461,265. About 400 tons of the sulphate of ammonia was re-exported.

The World Cotton Conference.

This Conference, it is understood, was held last month (October) at New Orleans, and the publication of its proceedings will be awaited with interest.

Sir Charles Macara, in an open letter to its President (Mr. James R. MacCole) and members, refers to certain general matters affecting labour and prices, of great international importance. This letter was freely circulated at the recent meeting of the British Association for the advancement of Science, held at Bournemouth, England, and some of the points may be noted here.

Sir Charles Macara has held many prominent international positions in regard to cotton, and he expresses regret at being unable to accept the invitation to be present at the New Orleans conference.

In regard to present *versus* pre-war prices, Sir Charles suggests that some of the questions for consideration are the following : How has the increase in ante-war prices been brought about? How much of the increase is due to the enhanced cost of labour and the other factors that enter into the production of cotton, as well as to the increased transport and other changes? And, most important of it all, how much of it is due to the manipulation of gamblers, who play no useful part in the carrying on of the industry, but are, an the contrary, a continual source of anxiety to everyone legitimately engaged in it?

Sir Charles also refers to the need of sustained efforts to secure reform, particularly in regard to the transport of cotton. Concerning the well-being of workers and the reconciliation of capital and labour generally, he calls attention to the need in great Britain of an Industrial Council such as was appointed in 1911. On this Council capital and labour were equally represented and connected with all the staple industries of the country. Had this Council been used since the war, problems of capital and labour would have been tackled much more effectively than has been the case so far.

Barenecked Fowls.

There is a breed of barenecked fowls not uncommon in these West Indian islands, especially in Barbados, where their reputation for hardiness is high. They are also considered good layers, and excellent table fowls. Their look is certainly against them, as the bare neck gives them a vulturine aspect, which is not handsome.

An article on this breed of fowls is published in the Cuban *Revista de Agricultura Comercio y Trabajo*, August 1919, in which the barenecked fowls are recommended for the qualities recognized in these other islands, as stated above. These fowls are sometimes known as 'Japanese,' but according to the writer of the article in the Cuban journal, this term is quite a mistake, as the breed originated in Eastern Europe, in Transylvania, and is very largely bred in Bohemia and Silesia. A good name for the breed —and a correct one—would be Transylvanian.

The bare neck appears to be dominant, as crosses between this and other breeds of fowls largely inherit the character.

A New Egg Preservative.

In connexion with the article in the present issue dealing with the preservation of eggs by means of 'water-glass' and lime-water, results of certain trials made in the West Indies with a new egg preserver called Xyloform, should be interesting. Some of this, apparently a cellulose preparation, was sent by a New York firm to the Imperial Department for special trial, and experiments were arranged for, and in due course carried out in St. Vincent, Montserrat, and Antigua.

The proprietors of the preservative claim that it will keep freshly laid eggs in good condition indefinitely. They lay stress, however, upon the fact that the eggs must be absolutely fresh, that is, not more than an hour or two old. This, of course, is a difficult proviso to contend with in practice, for in buying fresh eggs in large quantities there are bound to be many which are several days old.

However, to proceed with the account of the island experiments, it was found by the Agricultural Superintendent in St. Vincent that eggs laid six days prior to the treatment were after three months suitable for cooking purposes, though none of them, even the new-laid ones, were considered after that time suitable for table use.

The results from Montserrat were unsatisfactory, in the sense that they were not conclusive. The report of the Curator of the Botanic Station was as follows: 'Examination of the eggs was too long delayed, and they were all found to be in an unsatisfactory condition.'

From the Agricultural Superintendent, Antigua, the following statement arrived: 'Two dozen fresh eggs were obtained, and I personally treated them according to directions. One month after treatment one egg was broken, and for each succeeding month for three succeeding months one egg was tasted. Afterwards all the eggs were broken. In every case the eggs were bad and absolutely uneatable.'

It would appear, in conclusion, that provided only absolutely fresh-laid eggs are treated, xyloform may be used under tropical conditions for preserving eggs for cooking purposes for a limited time.

The Early Application of Nitrate.

In a recent communication, Dr. W. S. Myers, United States Delegation of the Chilean Nitrate Committee, states that excellent results have been obtained in Porto Rico and California from ploughing or harrowing nitrate of soda in at the time of application, and getting it in quite deep, that is to say, from 6 to 8 inches. Moreover, the earlier the application the better. Late applications, he states, are seldom satisfactory. The practice of top dressing with nitrate has, he believes, been largely responsible for some of the unsatisfactory results that have occurred from past experiments with this fertilizer.

The advantages to be gained from deep and early applications of nitrate are likely to be: (1) better conservation, i.e. less likelihood of being washed away by rain; (2) better distribution in the soil; and (3) early applications stimulate root development and tillering.

As to the relative merits of nitrate of soda and sulphate of ammonia, it may be of interest to observe that in Europe, experimenters agree that certain crops prefer the former source of nitrogen, while other crops prefer the latter. Some crops are indifferent. It would be interesting to have definite information as to which crops tend to manifest this preference in the tropics.

Wastage of Coal Products.

It is stated that by the consumption of raw instead of carbonized coal, the sum of £200,000,000 is lost annually to Great Britain. In other words, the value of the by-products which would be obtained by the economic treatment of coal, and which, under prevailing methods are dissipated, reaches this enormous sum. By failing to save the benzol, which would be sufficient for Great Britain's requirements, it is estimated that £20,000,000 is lost.

A matter of 6,000 cubic feet of gas, suitable for the enrichment of illuminating gas, or other purposes, is lost with every ton of coal burnt. Three times the present supply of electric power could be produced for sale at half the present unit, were power production and distribution reorganized on a scientific basis.

These are only a few of the items which it is estimated are wasted under the present methods of coal consumption. The wastage of large quantities of sulphate of ammonia, and of other valuable products, which form the basis of high explosives, dyes, paints, antiseptics, drugs, etc., are other items which stand out with startling prominence.

These particulars are given in Volume I, No. 2, of *Science and Industry*, the official journal of the Institute of Science and Industry of the Commonwealth of Australia.

INSECT NOTES.

INSECT PESTS IN BRITISH GUIANA.

The report for the year 1918 on the occurrence of insect pests of sugar-cane on the estates of Messrs. Curtis, Campbell & Co., and Messrs. Booker Bros., McConnel & Co., by Mr. H. W. B. Moore, has been received. Mr. Moore's reports on his work with insect control on these groups of plantations have been issued annually since 1911, and they have usually been reviewed in the columns of the *Agricultural News*. The report for 1917 was not so reviewed, however, the last previous one dealt with being that for 1916, the review of which appeared in the *Agricultural News*, Vol. XVI, p. 266, August 25, 1917.

The notes presented herewith are based principally on the report for 1918, but reference will be found to that of 1917. The insect pests dealt with and under observation in 1918 were the same as in previous years, as follows :—

The large moth borer (*Castnia licus*), the small moth borers, of which there are two species, the black-headed (*Diatraea saccharalis*), and the yellow-headed (*D canella*), the new small moth borer or the smaller small moth borer (*Elasmopalpus lignosellus*), the hardback (*Dyscinetus bidentatus*), the weevil borer (*Metamasius hemipterus*), woodants, locusts (*Schistocerca paranensis* and *S. pallens*), leaf-eating caterpillars (*Laphygma frugiperda* and *Mocis repanda*), and froghopper (*Tomaspis flavilatera*).

The large moth borer continued to be abundant on certain estates, but on others the degree of infestation, was less than in the previous year.

The measures employed for the control of this insect are the collection of the moths and caterpillars, and flooding the fields. That the system of collection is responsible for the death of many of these is indicated by the figures showing the collections made in each of the years 1914-18.

Table showing collections of *Castnia licus* :—

Year.	Number of estates.	Castnia moths.	Castnia caterpillars.
1914	17	503,180	1,551,000
1915	16	502,756	1,951,861
1916	16	200,454	1,349,292
1917	17	367,967	1,943,472
1918	17	208,568	2,485,136
		1,783,155	9,280,761

These figures are not to be taken as showing relative abundance over the whole group of estates, since the list does not include the same estates from year to year, although the number of estates does not vary much.

In the report on the work in 1917, Mr. Moore deals at some length with the matter of flooding.

The practice of flooding, which appears to be increasing in extent, is of two kinds: one called long flooding, when land to be rested is kept under water for from six months to a year ; and the other short flooding, when the flood is maintained long enough to kill Castnia and other insects.

It is pointed out that fields intended for immediate planting could be profitably flooded, for this would not only kill a very large proportion of the insects in the soil and in the plant material in, or on, the soil, but it would also prevent to a large extent the growth, in the interval between reaping and planting, of cane sprouts and other vegetation which in the ordinary way would be liable to infestation. Fields thus treated need not be searched for grubs; this would leave the gangs available for work in other fields, and a decided increase in the utility of the gang would thus be brought about.

Mr. Moore attacks the rule of thumb method prevailing on estates, which results in rigidity of practice when a certain amount of flexibility is necessary. It is shown that fields which are not due to be replanted on account of severe infestation of insect pests might be flooded, and the pests almost completely killed out.

Such fields might with advantage be replanted after short flooding. Long flooding, which is becoming more and more an estate practice, has for its object the general renovation of the soil. Insects and other organisms are killed out, the physical condition of the soil is improved, and its fertility restored to a large extent.

The small moth borers were still in 1918 the most damaging of the sugar-cane pests on these estates. The yellow-headed (*D. canella*) constituted for most of the time the greater bulk of the small moth borers. From 80 to 95 per cent. of the total were of this kind during the period from January to September. Mr. Moore reports that in an unusually long and severe period of drought the yellow-headed borer decreased in numbers, while the black-headed (*D. saccharalis*) increased at that time.

In this connexion it is stated that the yellow-headed is the stronger and more vigorous form, and appears to check and prevent the development of the weaker black-headed.

In this instance the drought appeared to have a direct effect in reducing the number of the yellow-headed, while a deficiency in egg parasitism was responsible for the great increase of the black-headed. While the collecting of the egg clusters has an influence in checking the black-headed borer, it is of no avail against the yellow-headed. At times when the yellow-headed is so much in excess that 90 per cent., of the collected caterpillars are of this form, it has been found that over 90 per cent. of the egg clusters collected belonged to the black-headed borer.

'The principal way of keeping the yellow-headed in check is steady, persistent, uninterupted, systematic and repeated cutting out of the borers, the work to be begun as soon as stools start to spring, and to be continued until growth is too advanced. Very helpful also would be the careful selection of uninfested tops for planting, and the immediate disposal of unwanted tops by deep burial, or by being removed, either to be burnt or thrown into cross-canals, or soaked for some days in ponds containing water.'

The flooding of fields from a few weeks to a year is stated to be very effective in the control of these borers. The black-headed oviposits on the green cane blade, but the yellow-headed does not, though the exact situation where the eggs are laid is not yet known, and flooding seems to act as a more effective check on the yellow-headed than on the black-headed form.

A new small moth borer recorded in the 1917 report is referred to in the report for 1918 as the smaller small moth borer. This has been indentified as *Elasmopalpus lignosellus*.

This insect has occurred in some numbers on a few estates, causing severe local damage It has made its heaviest attacks only in dry weather, but appears to have possibilities as a serious pest

The small black hardback (*Dyscinetus bidentatus*) is usually in evidence during the mid-year rainy season from May to August. In 1917 the attack of this pest was very severe on some estates, but in 1918 was rather less severe, on the whole, than in the former year.

In 1917, there was a severe attack on one estate by the larger black hardback (*Dyscinetus geminatus*), the grubs of which bored into the cane tops, killing large numbers of them. It is stated that the grubs spread to the canes from the large masses of decaying vegetable matter in the fields, and from the rank growth of grass that existed prior to replanting.

Locusts appeared in great numbers in 1917 in Essequibo. They were collected by means of a sheet smeared with molasses and tar, against which the hoppers were driven. They were driven into a large canal, where boys beat them under the water with branches. Millions of eggs were collected. This insect was (*Schistocerca paranensis*), a migratory locust. The ordinary locust (*Schistocerca pallens*) occurred as usual but without any particular outbreak.

The leaf-eating caterpillars were not particularly in evidence either in 1917 or 1918.

The weevil borer and white-ants were locally abundant. These two insects appear to work together.

Froghopper attacks occurred only in limited areas on three widely separated estates in 1918.

The following paragraph is quoted, as showing the standing given to this insect as a pest in British Guiana :—

'Undoubtedly the froghopper is a pest, and does a certain amount of harm, but I have not yet noticed it rampant in fields where things were more or less in favour of the cane. In other words, it has a predilection for weak canes, those whose surroundings are insanitary. It can hardly, then, I would say, be described as an unmitigated pest, as it would seem that it can be made to serve a useful purpose by pointing out that all is not right with the canes in the fields in which it abounds.'

In regard to the control of froghopper, it is stated in the report (1918) that, 'while direct ways of combating the pest are all very well and good, the principal points to be kept in view are that clay soils, during the mid-year rainy season particularly, should, as far as possible, be in such a condition as to be always warm and open, not cold, heavy and water-logged, and that the surest and best safeguard against attack is an environment that, tends towards the production of healthy and vigorous canes.'

The following figures, which show the numbers of insects collected by the insect gangs during 1918, indicate the extent of the work in the direct control of these pests :—

Large moth borer, moths and caterpillars	2,693,701
Small moth borer, caterpillars and egg clusters	27,680,621
Hardback beetles	179,771
Weevil borer, beetles and grubs ...	828,828
Wood-ants' nests	172,865
Locusts	32,611
Froghoppers	2,611,285

The work in practical entomology which is reviewed above, appears to be conducted on sound lines, and should be productive of much good. The destruction of large numbers of insects, and a proper appreciation of the need for greater care in the selection of the sugar-cane cuttings for planting, and of the importance of proper cleaning up after the crop is reaped, are bound to have effect in the improvement of the general conditions. The recognition of a basic principle such as that to be found in the paragraph quoted on the froghopper, is bound to have its effect in improved agriculture. It seems safe to assert, that the production of sound, healthy, canes will be accompanied by a reduction of the severity of attack by froghopper and certain other insects.

H.A.B.

JAMAICA LOGWOOD.

As the result of complaints regarding the disproportion between the price of logwood crystals in London and the amount received by Jamaican growers for their produce, the Jamaica Imperial Association has issued a circular letter to growers, suggesting certain steps for protecting the local industry from unfair exploitation.

After pointing out that the crude material employed in making a ton of crystals costs not more than £40 in Jamaica, and that the price of crystals in London was from £200 to £220 per ton, the Association's letter states that the highest possible freight rate will not account for this great difference, and asserts that logwood producers are being exploited. It invites producers to say whether they are prepared :—

(1) To form a Logwood Growers' Association to contract for the sale of wood belonging to its members so as to ensure the payment of fair prices.

(2) To contribute to a fund out of which loans at interest might be made to small growers, or purchases made of wood of small growers.

(3) To subscribe to the fund £1 per ton of their estimated annual output.

It is also proposed that the Association should have power to erect a factory for the manufacture of logwood extract, if deemed necessary.

Logwood producers are supporting the efforts of the Jamaica Imperial Association, and several large property owners are willing to furnish a portion of the capital for the erection of a factory, if such a step be found necessary. There are two large logwood extract factories in Jamaica. One is owned by an English firm. British capitalists are completing a third factory in the colony. Shortly after the outbreak of war, logwood, which had fallen to a price which made it anything but a paying business, jumped to figures that brought fortunes to many producers of the article. The high prices lasted some time, and then there came another decline, from which the local Imperial Association is trying to lift the industry. (*The Times* Trade Supplement, August 2, 1919.)

Momordica Cochinchinensis.—The receipt of seeds of this plant and their distribution to Agricultural Departments, in the West Indies for trial was noticed in the *Agricultural News*, February 22, 1919. Mr. J. Jones, Curator, Botanic Gardens, Dominica, has recently forwarded to the Imperial Commissioner of Agriculture, a fruit produced by a plant grown from the seed sent him in February. He states that only a few of the seeds germinated, and the plants made but little progress on account of the dry weather up to the end of June. When rain fell in July the plants grew rapidly, and male and female flowers were produced on separate plants. During the first week in August pollination was effected artficially, with the result that fruits are now ripening. Mr. Jones believes that this plant may possess a considerable potential value on account of the oil contained in its seeds, which is remarkable for its drying properties. The flowers of this species are pale-yellow in colour, and are distinctly handsome, particularly the male or staminate ones, which are larger than the pistillate flowers produced on the female plant.

GLEANINGS.

The *Dominica Chronicle*, October 15, 1919, draws attention to the proposed formation of a Dominica Fishing Company. A meeting for the development of the scheme was to be held the next day. The outcome will be awaited with interest.

A correspondent writing to the *Journal of the Royal Society of Arts*, August 20, 1919, suggests that one contributory cause of spontaneous combustion in coal cargoes is the force with which coals are loaded, arising from the height from which they are dropped into the ship's hold.

In connexion with the utilization of molasses for the manufacture of motor spirit, the *South African Sugar Journal*, June 1919, notes that the Natal Cane By-Products, Ltd, are importing a special still for the manufacture of chloroform, which will be run in connexion with their other plant.

According to the Report on the Season and Crops of Assam, for the year 1918-19, rice is the principal crop grown in the province, it covers an area of 4,583,140 acres, or about 73 per cent. of the total cropped area, and shows a decrease of 219,654 acres as compared with the previous year.

The *Indian Trade Journal*, August 1, 1919, states that the principal exports from Palestine nowadays are barley from the port of Gaza, and oranges and wine from Jaffa; lately also almonds have come into prominence as an export. Palestine wines have now become famous the world over.

The *Egyptian Horticultural Society's Review*, July 1919, in reference to the Saman tree (*Pithecolobium Saman*) says that this magnificent tree has recently been introduced from the West Indies into Egypt, and appears to have found the climatic condition of the country to be congenial to its growth.

According to the Porto Rico *Progress*, September 19, 1919, the citrus crop of the island, which was then beginning, to be harvested, is estimated at little more than a million boxes. This is about one-half of what the crop was expected to be three or four months ago. Since that time there has been a heavy dropping of young fruit.

The Acting Director of Agriculture, Trinidad, Mr. W. G. Freeman, in his report on the Examination in Agriculture of teachers for certificates, 1918, states that, on the whole, the work was fairly satisfactory, but from the point of view of the future usefulness of the candidates as teachers, it is evident that they should be induced to give much more attention to practical work, and observation of natural objects.

The British Union Oil Company not only intends to establish an oil station in Barbados, but also to bore for oil throughout the colony, and ascertain whether Barbados contains sufficient oil for commercial purposes. The belief that oil of a high grade is to be found in the island has been held by many experts who have visited Barbados from time to time. (*The Times* Trade Supplement, September 20, 1919.)

It would appear that in almost all parts of Travancore arrowroot grows wild. Little, however, is done with the root except that it is used for culinary purposes. In many of the districts where the root is grown it is merely sliced and dried, and exported in that condition. In others, the extracting of the flour is done by local and crude methods, which are wasteful. (The *Indian Trade Journal*, July 11, 1919.)

An extensive dyewood and chemical factory is being completed at the south-western end of Jamaica. It is owned by British capitalists, and will be known as the Yorkshire Dyeware and Chemical Company. It is hoped that the factory will be in operation by the end of the year. A plentiful supply of water has been provided by means of a canal 3 miles in length. (*The Times* Trade Supplement, September 20, 1919).

The aggregate value of the trade of the Federated Malay States amounted to £34,884,583 in 1918, as compared with £40,467,296 in 1917. This decrease in value appears to be owing to the difficulties of marketing their plantation rubber. The fall in the value of rubber exported was £8,486,834, but tin showed an increase of £431,046. (The *Chamber of Commerce Journal*, August 1919).

There are at present in the Philippines eighteen sugar centrals, with an approximate total daily milling capacity of 7,000 tons of cane. These mills are situated in seven different provinces, but ten of them, with a capacity of more than 3,000 tons of cane daily, are in the island of Negros, where the erection of five more modern mills, with a total capacity of 5,000 tons of cane daily, is projected. (*The Board of Trade Journal*, August 7, 1919.)

Agriculture is essentially an industry in which energy and experience will prove the main factors for success—but experience should include experiment. Scientific and up-to-date farmers recognize the value of experiment and research directed to the solution of agricultural problems. The best results can only be obtained by combining practical experience of farm work with a knowledge of the new facts which science has revealed. (The *Journal of the Board of Agriculture*, August 1919.)

THE WORK OF THE TRACTOR.

For a sound, reliable and comprehensive article on the work of the motor tractor, we may refer the reader to the *Journal of the Royal Agricultural Society of England*, Vol. 19 (1918). The article is by Mr. E. H. Garrad, who, as an agricultural expert in the employ of the County Councils of Kent and Surrey, had practical experience during the war in connexion with the employment of tractors by the Government at the critical time when the food supply of the nation was in jeopardy.

Concerning the initial difficulties, Mr. Garrad says: 'Although agricultural tractors were still, in the opinion of most farmers, only in their infancy, the Government took steps to purchase every tractor of almost any make that was available. Some were manufactured by English firms; the majority came from abroad. The initial difficulties in getting them to work were enormous. Many of the makes were practically unknown in this country; there were no trained engineers to demonstrate them or train the drivers; there were no available men accustomed to machinery to be taught to drive or treat them properly; there were no supplies of spare parts in the country, nor manufacturers to make them; and there were no experienced engineers to repair the tractors when they broke down. The tractor ploughs that came over with the tractors from America had, in most cases, never been tried in England before, and many were found to be unsuited to English conditions. The whole thing was one great experiment, the cost of which was only justified at the time by the seriousness of the food situation.

'Each different make of tractor had its opportunity. Many, from one cause or another, failed; some proved successful. In Kent alone, fifteen different makes have been tried, including the Overtime, Titan, Mogul, Emerson, Fordson, Case, Sandusky, Burford-Cleveland, Roston Proctor Caterpillar, Dungay-Weeks, Parret, Saunderson and Mills, Whiting-Bull, and Sampson. Many of these had to be discarded owing to the impossibility of obtaining spare parts in sufficient quantities, and the only makes now being employed by the Kent War Agricultural Committee are the Titans, Overtimes, and Fordsons. The number of tractors belonging to the Committee in the county at the present time is 180, and comprises 112 Titans, 64 Fordsons, and 4 Overtimes.

'Of the American tractor ploughs and other implements imported with the tractors, many proved quite unsuitable for English conditions, but in other cases it was found possible to adapt them, so that good work resulted. In Kent, there are 242 tractor ploughs belonging to the Committee, including 75 Ransomes, 55 Howards, 53 Olivers, 28 Cockshutts, and 28 Saundersons, and 129 Tractor-cultivators, chiefly Martins. The relative popularity of the various makes is by no means the same in different parts of the county. In fact the farmers in one part of the county ask for one make of plough which farmers in another part of the county refuse altogether. Different makes suit different local conditions and types of soil.

'With a lack of experienced drivers or even of the material from which to train them, with a lack of experienced engineers to repair the tractors when they break down, and of the adequate supply of spare parts, everything has been against the success of the Government tractors, but in spite of all these disadvantages they achieved their object, which was to increase the home-grown corn supply of the country, and proved their value as arable land machines. The trade in agricultural tractors is increasing daily, and there is scarcely a farmer occupying 200 acres or more of arable land who has not already begun to consider whether it would not be to his advantage to become the owner of a tractor.'

Mr. Garrad then deals with the conditions necessary for the successful employment of tractors. In this connexion he refers to certain advantages in using a one-way or balance plough. Concerning tractor work on the side of a slope, this is stated not to be satisfactory.

After describing the advantages and disadvantages of different types of tractors—the Caterpillars, the three-wheeled tractor of the Moline type, and four-wheeled tractors—the writer proceeds to discuss the suitablity of tractors for various farm operations.

As to the amount of ploughing per day that a tractor may be expected to do, the writer says, in reference to figures obtained from private tractor owners:—

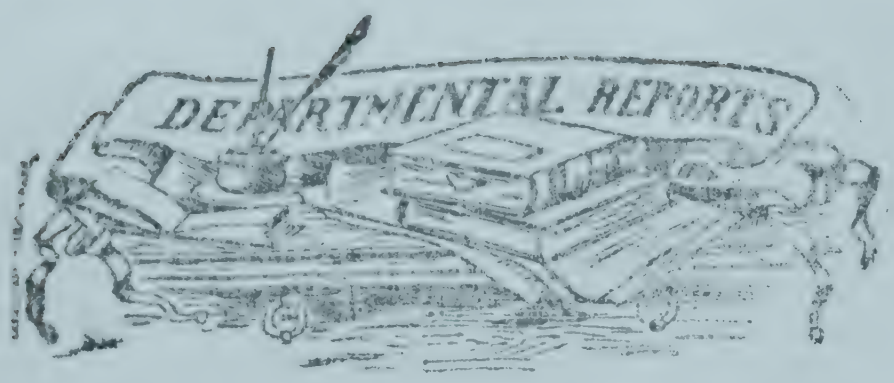
'These figures show that a tractor in private hands should plough $2\frac{1}{2}$ to $4\frac{1}{2}$ acres of land per eight working hours, according to the make of tractor, with the fuel consumption of 3 to 4 gallons per acre. These tractors have, of course, only been worked when conditions are favourable, whereas the Government tractors have been at work under all conditions whenever work was in any way profitable, and as a rule have been set by farmers to plough the worst fields on their farms. In nearly every county, however, a Government Fordson Tractor with a self-lift plough, has ploughed over 5 acres in the day, under favourable conditions, in the hands of one confident man or woman, whilst the same tractors have frequently cut 15 acres of corn in the day with a self-binder.'

The next point dealt with is wear and tear, which is followed by considerations of the advantages to be expected from the use of tractors on the farm. 'The greatest enemy to the tractor' says Mr. Garrad, 'is the weather. It is essentially a fine weather machine, and in ordinary conditions a farmer is well advised to get forward with his work in the autumn, and then put the tractor away until February or March when the land will have again become workable.'

As to the defects of the tractor, in the writer's opinion, 'many of the present day tractors are too heavy and clumsy. Practical experience has proved that a light tractor will stand up to its work where a heavy tractor has to stand still, and given sufficient power, the light-weight tractor has many advantages over the heavy one, especially as regards price.'

Concerning ploughs, Mr. Garrad says: 'The ploughs attached to the tractors are quite as much in need of improvement as the tractors themselves. The speed at which the tractor travels affects the quality of the work by a particular plough, and an adjustment which is suitable at one speed may be quite unsuitable at another. This is a matter that requires urgent attention at the hands of the manufacturers. Tractor cultivators are also capable of improvement, and there is not yet on the market a satisfactory tractor harrow.'

The decline in the vanilla industry in the Seychelles was noticed in the report on the Agricultural Department of those islands for 1917, which was reviewed in the *Agricultural News*, May 31, 1919. If however the vanilla business has fallen away, the *Perfumery and Essential Oil Record*, July 1919, states that the distillation of essential oils has notably increased. The oils produced are ylang-ylang, vetivert, cinnamon bark and cinnamon leaf oils, but especially the last named.



DOMINICA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1918-19.

This annual report, which has been lately published, contains, as usual, much matter of interest not only to Dominica planters, but to tropical agriculturists in general. Some of the subjects referred to in the report have been already noticed in recent numbers of the *Agricultural News*.

Although the Agricultural Superintendent, Mr. J. Jones, complains that, owing to the absence of an assistant for most of the year, very little has been effected in the way of special investigations or the undertaking of new lines of work, yet the report is a record of excellent work carried out on former lines, especially with reference to the two main crops of Dominica, limes and cacao.

The lime crop for 1918, calculated in barrels of a capacity of 4·55 cubic feet, amounted to 318,074 barrels of fruit. This is the smallest crop recorded for a period of nine years, and when compared with the output during 1917, shows a falling off of no less than 78,000 barrels of fruit.

Though weather conditions were favourable, the year was a bad one for the lime industry. A short crop, an embargo, placed by the Government of the United States, on citrus products, and other difficulties caused by the war, created an unpleasant situation for the lime planter. While other West Indian islands in which sugar and cotton are the main products have benefited by high prices during recent years, Dominica has suffered in many ways.

The bulk of the crop of the island is shipped as concentrated juice, in which condition it can be kept for a considerable time. Efforts are being made in the direction of substituting steam evaporators in the place of the open fire process of concentrating lime juice, in order to bring into more general use an improved system, which will reduce by about 10 per cent. the considerable destruction of citric acid which now goes on under the old process.

The preventable losses in the process of concentration, though in course of being reduced, are still considerable, and when to these are added the losses caused by inefficient milling, the extraction by some mills being as low as 7 gallons per barrel of fruit, when it should be at least 8 gallons, and, in particularly good work, 8½ to 9 gallons, it will be seen that much still remains to be done before the industry is on a really sound basis, and capable of meeting on equal terms the active, businesslike and intelligent competition with which it is now threatened by lime growers in other West Indian islands and foreign countries.

The increase in the exports of raw lime juice since 1914, which is nearly double those of normal years, has been due to special circumstances which end with the war. In the near future shipments to the United Kingdom are likely to be on a much lower scale. It is generally thought that Canada and the United States offer the best possibilities for an increase of this business.

The decline in the production of citrate of lime continues, having fallen from 5,191 cwt. in 1914 to only 800 cwt. in 1918. There has also been a decrease in the export of lime oils.

The effect of the United States embargo on fresh limes is shown by the fact that the export of this fruit in 1914 was as much as 45,283 barrels, and only amounted to 7,670 barrels in 1918. It is to be hoped that a revival in this trade may soon be experienced, as it is of great importance to the community.

With regard to the production of cacao, Mr. Jones thinks that there is no increase in the interest taken in this cultivation, which must inevitably decline still lower if no new areas are planted out.

The fall in the export of coco-nuts is most marked. In 1918 there were only 89,676 nuts exported, as against 554,549 in 1914. This is attributed partly to the Government prohibiton of exportation for a part of the year in the interests of the local food supply, but still more to the disastrous effects on the plantations brought about by the hurricanes of 1915 and 1916.

In the Experiment Station the series of manurial experiments relating to orchard crops, especially limes and cacao, are being continued, and the record is of permanent value.

Extracted oil from two varieties of the Bay tree (*Pimenta acris*) occurring in Dominica has been submitted to experts in England, with the result that the oil derived from the locally named 'Bois d'Inde' is reported on as an oil of the type usually imported from the West Indies, although the specific gravity is a little below the average.

This oil extracted from the other variety, 'Bois d'Inde citronelle,' is described as follows:—

'The oil differs from the ordinary type of bay oil in having a strong odour of citral, which is the chief constituent of lemon grass oil. As a mixture of bay oil and lemon grass oil is frequently used in toilet preparations, it would probably have a commercial value of its own.'

This emphasizes the necessity of care in the production of bay oil so as not to permit of any mixture of the leaves of the two varieties.

It is interesting to note that the training of a limited number of agricultural pupils on sound lines is being again undertaken by the officers of the department.

BRITISH VIRGIN ISLANDS: REPORT ON THE AGRICULTURAL DEPARTMENT, 1918-19.

From the report under review it would seem that agricultural prospects in these islands are improving in some respects. The cotton industry in particular is evidently awakening increased attention, the value of the exports of cotton and seed having risen from £1,229 in 1917 to £2,569 in 1918. The cotton produced is dealt with chiefly at the Government Ginnery on a profit sharing basis, and the results seem to give satisfaction to all concerned.

A point of interest is mentioned as regards the cotton cultivation in the British Virgin Islands. Mr. Fishlock in his report states as follows:—

'Practically all the cotton grown in the Presidency during the crop season was grown from local seed, only a small quantity of seed having been obtained from St. Kitts, the usual source of seed for planting purposes. The use of locally grown seed for planting purposes is not to be recommended. It was found that the cotton resulting from such seed was of a poor grade and liable to mixture. So many plants of hybrid cottons are to be found growing wild in all parts of the Virgin Islands that it is

impossible to maintain pure strains. With present conditions, the only way to maintain a fair type of cotton is by the annual importation of good seed.'

In view of the above given conditions, it would seem that the advice to cotton planters in those islands is, at least for the present, sound.

Another agricultural interest which has become of considerable importance in the year reported on is the production and export of fruit and vegetables, the export value of these commodities having risen from £154 in 1917 to £1,339 in 1918. The easily accessible market for these products which the neighbouring American island of St. Thomas affords, especially it would seem for sweet potatoes, holds out considerable promise for the future prosperity of this branch of agriculture. About this, Mr. Fishlock writes :

'This is probably destined to be one of the most important crops grown in the Virgin Islands during the next few years. The establishment of a Naval Station at St. Thomas, with the presence of a considerable number of men, has created quite an unprecedented demand for ground provisions of all kinds, and especially sweet potatoes. This tuber has been commanding prices unheard of a few years ago, and production has been stimulated to a considerable degree.

'The experiments conducted at the Station during the last nine years should accordingly have increased value, as it is of importance to know which varieties are best suited to local conditions. It is also important to have some knowledge of the cooking qualities of the potatoes. Information of this nature will be found in this report which embraces results covering, in several instances, nine years' work along the lines indicated.'

It is to be regretted that the coco-nut industry, which appeared capable of considerable extension in the British Virgin Islands a few years ago, has evidently lost its interest for the cultivators in those islands, many spots of which are well suited to coco-nut culture.

HOW TO PRESERVE EGGS.

While in the West Indies the increased production of eggs by means of improved strains of laying hens is the urgent requirement in the poultry industry, the matter of preservation dealt with below, is not lacking in importance. The statements given are taken from the *Philippine Agriculturist* :—

Lime-water as an egg preservative is to be preferred to the other substances employed in the present experiments, for the following reasons : (1) it is inexpensive ; (2) readily obtainable, and is (3) capable of preserving eggs for as long a period as eight months. The eggs preserved for four or five months in lime-water could hardly be distinguished in quality and quantity of contents, either when raw or after cooking, from fairly fresh eggs. However, the egg contents may acquire a slightly chalky taste.

Water-glass to the strength varying from 5 per cent. to 10 per cent. may prove effective. A 5-per cent. water-glass solution is to be preferred, inasmuch as it gives almost as good results as the 10-per cent. solution, and is prepared much more cheaply. A litre of this solution costs approximately 13 centavos. Eggs preserved for six months in the 10 per cent. solution had no acid taste, while those in the 5 per cent. solution were noticed to be acid after five months.

Vaseline as a preservative for eggs proved as effective as both lime-water and water-glass. It is not very practical for the following reasons: (1) it is rather expensive; (2) varnishing each egg with vaseline with the fingers takes time ; (3) it is oily and readily collects dirt, making the shell appear old ; (4) even at the first month it imparts to the eggs an oily taste, which is not agreeable. Otherwise, it preserves eggs for a period of eight months.

For two or three months' preservation fresh cane molasses, dry coarse common salt, rice bran and dry lime may be recommended.

Soaking the eggs in 5 and 10 per cent. common salt solution, and packing the eggs in the salt and sand mixture for one or two months will prove satisfactory for making salty eggs. Eggs preserved in salt and sand mixture should be soaked in fresh water for about twenty four hours before cooking ; otherwise the egg contents will be extremely salty. In all cases the preserved eggs tested were boiled for ten minutes.

The following observations appear in the same Journal on the behaviour of chickens in pens with and without males, with regard to feeding, egg production, etc. :—

One hen in a pen may be a stronger feeder than another, yet the number of eggs she produces may be less than that produced by a hen which is a moderate feeder.

Moulting occurred in three pens during the period between the beginning of July and the latter part of December. In all probability hens did not moult at the same time.

It was observed that hens were fatter when they were laying, and became thinner toward the period of broodiness.

An average hen produced from 34·92 to 39·02 eggs, and consumed from 18·061 to 20·338 kilograms of grain and from 3·14 to 4·22 kilograms of dry mash rations, excluding the animal, mineral and succulent feeds during a year.

From the results obtained, it is safe to conclude, that the presence of roosters in the pen does not influence the production of eggs, for a pen which was not provided with a rooster yielded practically as many eggs as the others.

INCREASED SIZE OF PAPAW FRUIT.

In the pamphlet, *Fruit Culture in Malaya*, which was noticed in the last number of the *Agricultural News*, there is given information with regard to a method of increasing the sizeof papaw fruits. This is reproduced below ; and perhaps some of our readers may care to make the experiment, and report results:—

'An interesting, but rather curious, method of cultivation for the production of large fruits, is sometimes practised. When the plant is 3 inches in diameter at the base, a hole is bored into the trunk about 6 inches from the ground. The hole is made about 1 inch deep and sufficiently large for a piece of rubber tubing to be inserted. A quart bottle is half-filled with sugar, and water added. When the sugar is thoroughly dissolved, the bottle is connected to the hole by a piece of rubber tubing. In twenty-four hours the tree will have absorbed the contents of the bottle. A gunny-sack is wrapped over the lower fruit and trunk to hasten the ripening of the fruit. It is stated that if these directions are carried out, fruits averaging 10 to 12 inches in diameter will be produced.

'During the fruiting stage, several of the smaller fruit should be removed to allow the remainder proper development.'

MARKET REPORTS.

London.—The West India Committee Circular, September 4.

Balata—Venezuelan Block, no quotations; West Indian Sheet, 4*s.* 4*d.*
Beeswax—No quotations.
Cacao—Trinidad, 123*s.* to 128*s.*; Grenada, 116*s.* to 126*s.*; Jamaica, St. Lucia, St. Vincent, and Dominica, 115*s.* to 127*s.* 6*d.*
Copra—£58.
Honey—Jamaica, 70*s.* to 80*s.*
Lime Juice—Raw, 2*s.* 6*d.* and 3*s.*; Concentrated, no quotations.
Pimento—5½*d.*
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

Barbados—Messrs. T. S. Garraway & Co., September 16.

Arrowroot—$8·00 per 100 lb.
Cacao—$22·00 to $24·00 per 100 lb.
Coco-nuts—$60·00 husked nuts.
Hay—$4·50 to $4·75 per 100 lb.
Onions—$12·00.
Peas, Split—No quotations; Canada, $8·50 to $10·00.
Potatoes—No quotations
Sugar—Embargoed.

London.—The Perfumery and Essential Oil Record, September 21, 1919.

Bay Oil—16*s.* to 17*s.*
Lime Oil—Flat, at 3*s.* 9*d.* to 4*s.* for West Indian distilled, and 11*s.* for hand-pressed.
Orange Oil—West Indian sweet, 8*s.* 6*d.* to 9*s.* 6*d.*; bitter, 9*s.* to 10*s.*

Trinidad.—Messrs. Gordon, Grant & Co., October 7.

Cacao—Venezuelan, $26·00 to $27·00; Trinidad, $25·50.
Coco-nut Oil—$2·35 per gallon.
Coffee—Venezuelan, 32c. per lb..
Copra—$10·00 per 100 lb.
Dhal—$11·50.
Onions—$10·00 per 100 lb.
Peas, Split—$9·00 per bag.
Potatoes—English, $4·00 to $4·50 per 100 lb.
Rice—Yellow, $12·00; to $13·00 White, $12·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., October 3.

Cacao—Caracas, 28c.; Grenada, 24½c. to 24¾c.; Trinidad, 24½c. to 25c.; Jamaica, 20½c.
Coco-nuts—Jamaica selects, $88·00; Trinidad $88·00; culls, Jamaica, $60·00; Trinidad $60·00 per M.
Coffee—Jamaica, 20½c. to 24c. per lb.
Ginger—21c. to 24c. per lb.
Goat Skins—Jamaica $1·60; Antigua and Barbados, $1·60; St. Thomas and St. Kitts, $1·50.
Grape Fruit—Jamaica, $5·00 to $5·50.
Limes—No market.
Mace—40c. per lb.
Nutmegs—19c. to 19½c.
Oranges—$2·50 to $3·00.
Pimento—9¼c. per lb.
Sugar—Centrifugals, 96°, 8c.; Muscovados, 89°, 7c. Molasses, 89°, 6½c. all duty paid.

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AGENTS FOR PUBLICATIONS OF THE IMPERIAL DEPARTMENT.

London: Messrs. Dulau & Co., Ltd., 34-36, Margaret Street, Cavendish Square, W.
West India Committee, 15, Seething Lane.
Barbados: Advocate Co., Ltd., Broad Street, Bridgetown.
Jamaica: The Educational Supply Company, 16, King Street, Kingston.
British Guiana: The Argosy Co., Ltd., Georgetown.
Trinidad: Messrs. Muir-Marshall & Co., Port-of-Spain.
Tobago: Mr. C. L. Plagemann, Scarborough.
Bahamas: Mr. H. G. Christie, Board of Agriculture, Nassau.
Grenada: Messrs. Thos. Lawlor & Co., St. George.
St. Vincent: Mr. J. D. Bonadie, 'Times' Office.
St. Lucia: Mr. R. W. Niles, Botanic Station.
Dominica: Mr. J. R. H. Bridgewater, Roseau.
Montserrat: Mr. W. Robson, Botanic Station.
Antigua: Mr. S. D. Malone, St. John's.
St. Kitts: The Bible and Book Supply Agency, Basseterre.
Nevis: Mr. W. I. Howell, Experiment Station.
Canada: Lewis W. Clemens, 801, Yonge Street, Toronto.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

	PAGE.		PAGE.
Agriculture in Barbados	357	Jippi-Jappa	359
Accident to a Dog with a Fruit Case	363	Market Reports	368
Banana Cider	366	Notes and Comments ...	360
Cotton Bush, Manurial Value of	358	Porto Rico Agricultural College, The ...	365
Department News ...	357	Potato, Sweet, Remarkable Yields of, in Montserrat	359
Exhibition in Barbados, A Forthcoming Local ..	361	River Estate, Trinidad...	360
Farmyard Manure, Making without Animals ...	361	St. Croix Experiment Station, Some Achievements of The... ...	365
Fish Supplies, West Indian	353	St. Lucia, Recent Exports from	359
Gleanings	364	Salt, Tolerance of, by the Sugar-cane	356
Grenada, Agricultural Inspection in	367	Seeds, Electrical Treatment of	367
Hevea Rubber, New Facts concerning ...	358	Settlers, New, in the West Indies, Opportunities for	360
Human Mortality in British Guiana ...	366	Skunks and Toads ...	361
Impressions of an American Sugar Chemist in the West Indies	354	Sugar Factories, Fuel Oil for	356
Insect Notes :—		West Indian Products ...	367
Control of Ear Ticks...	363		
Entomology in Porto Rico	362		

The West Indian Fish Supplies.

THE value of fish and fish products imported from abroad into Barbados alone, is worth annually something like $550,000. This is a large sum of money for one class of food like fish, and for a single colony. Some of this fish, which is mostly of the cured description, is, it is true, re-exported to other islands, but the fact remains that those who would like to see this imported fish displaced by locally caught supplies are up against a difficult problem. Men who have interests in the fish trade and make a good living by it, are not easily to be ousted. They may be expected to oppose any organized efforts to increase local production beyond a point sufficient to supply the fresh fish trade. Their support can only be gained by incurring their interest from a patriotic and from a commercial standpoint.

This aspect of the matter, we believe, has been overlooked in most of the well-intentioned articles that have appeared from time to time in West Indian newspapers. Much has been written of late in Jamaica on the subject of increasing the local supplies of fish, and in Dominica a company has been formed recently for doing it; but it would appear to be a desirable preliminary to secure, in the first instance, the sympathetic co-operation of those who are engaged in the present import trade.

That this import trade has been allowed to reach its present dimensions is an indication of a great want of energy and enterprise in regard to West Indian fisheries. Here are islands situated in seas abounding in edible fish and related animals. Yet the people prefer to put large sums of money into the hands of merchants, and send still larger sums abroad, rather than develop their own resources and keep the money circulating in their own country.

There are two principal matters in regard to fishery developments that require special attention. The first is rapid transit, and the second is the question of curing. Once these two problems are solved, and those interested in the fish trade are brought to an understanding, there is no reason why the greater

part of the West Indian fish trade should not be supplied from local sources.

Concerning the first point, we know that fish keeps a very short time in a warm climate. For fish to be kept in cold storage or cured successfully, it must be fresh. Therefore some quicker method of transit than the ordinary sail-boat, and some quicker method of land transit than carrying by hand is obviously required. Fishing motor-boats would probably be found to answer well, or even properly constructed sail-boats with fast lines and deep keels to enable plenty of sail to be carried. The employment of these would greatly expedite matters. Then as regards land transit, the use of motor-vans for collecting the catches brought in at regular times, according to an organized plan, would obviously be an immense advantage.

Curing is a big subject which still requires much investigation under tropical conditions. Work is being done in Jamaica in the matter of curing fish at sea, but so far, has not given satisfactory results. Salt curing on land is the better practice. There is also to be considered the best fish to cure. Popular prejudices have to be considered, also popular taste. It is quite likely that the taste of cured West Indian fish might take some little acquiring at first. But these matters could well be dealt with by a Fisheries Board. Such a Board could be nominated by the local Government, and one of its members should, if such a person exist, be a merchant who is as much interested in the welfare of his island as in the importation of cured fish from Canada. This Board could collect the names of local fishermen, information as to the extent of their interests, and their willingness to co-operate. Questions as to present supplies, the regularity, distribution, and possibilities of increase, could be entered into; experiments in curing could be started; the fundamental problems of quicker transit referred to above could be considered, and the necessary action to be taken, might be indicated.

As regards more technical investigations, such as the study of the methods of fishing, the habits of different fish, especially breeding and shoaling—for these investigations an expert would be required. At present the principal methods of fishing are four: the driving method of catching flying-fish at Barbados; snappering by means of lines of about 100 yards; the fish-pot or trap fishing; and the Seine net method. These might be improved upon. In Jamaica, a method known as stake-net fishing, which is really an extension of the fish-pot method, has proved successful. On the other hand, most of the northern methods such as trawling and line fishing with one- or two-mile lines with a thousand hooks have not given satisfaction. Trawling is interfered with by the existence of coral reefs; deep-sea fishing with long lines by predaceous fish like Barracoutas, which attack and eat the fish caught on the hooks. These considerations show that careful experimental work, as well as enterprise are needed if it is hoped to improve present methods of securing fish.

There is probably a good opening for a 'fish'-canning business. Canned lobster is an important industry in the Bahamas and Turks Islands. Turtles, sea-eggs, and the mangrove oysters all give rise to minor industries in certain places, and they all call for critical investigation. One difficulty at present is that most of the detail knowledge concerning the fishing industry in general is possessed by the fishermen themselves. These men, though by no means unintelligent, are frequently illiterate and uneducated, and being also of independent character, are not easy to deal with. Educated people of good standing, who are familiar with the fisherman class, and who have their confidence, could do their island and the fishing industry a good service, by taking an active interest in the development of fishing, and by bringing their influence to bear in the right quarters to ensure an early and practical inquiry into a matter of very great economic importance.

SUGAR INDUSTRY AND RESEARCH.

IMPRESSIONS OF AN AMERICAN SUGAR CHEMIST IN THE WEST INDIES.

Not very long ago some of the British colonies in the West Indies were favoured by a visit from Dr. C. A. Browne, Chemist of the New York Sugar Trade Laboratory, Inc., who came with the object of making a general survey of the sugar-cane work and scientific investigations carried on in the different colonies.

Recently there has appeared in the *Journal of Industrial and Engineering Chemistry*, a paper entitled 'The Industrial and Agricultural Chemistry in British Guiana with a Review of the Work of Professor J. B. Harrison.' This paper, which is by Dr. Browne, is based upon information obtained by him while in that colony. It is reproduced in the *Louisiana Planter* for September 20, 1919. It constitutes a comprehensive account of Professor Harrison's scientific and economic work, and indicates how highly it is appreciated by the writer of the paper.

In the paper under review a general account is given first of the colony's sugar industry. It is pointed out that the greater part of the sugar output of British Guiana consists of grey or dark crystals which are exported to Canada and the United States for refining, and the well-

known yellow or Demerara crystals, which are exported to the United kingdom for direct consumption. The largest sugar factories of British Guiana are referred to as having up-to-date milling facilities, consisting of crushers and nine-roller mills. An interesting point in regard to the properties of British Guiana raw sugar is the low optical activity of the invert sugar, and this has been attributed to the high saline content of the cane juice. In the course of this account of the sugar industry, a description is given of the method of manufacturing yellow crystals, and the writer then proceeds to refer to the personal work of Professor Harrison in regard to the chemical and biological aspect of sugar-cane cultivation. Mention is made of his work with seedling canes, studies which resulted directly from his association with the pioneer work in Barbados. Concerning the manurial requirements of sugar-cane in British Guiana, it is pointed out that Professor Harrison's experiments show that, when applied to sugar-cane in amounts exceeding 50 to 60 lb. per acre, sulphate of ammonia is the most economical and efficient fertilizer for heavy clay alluvial soils Nitrate of soda is a less satisfactory source of nitrogen.

After referring to Professor Harrison's other work on soil problems in connexion with sugar-cane cultivation, the writer goes on to consider by-products of the sugar industry, including spirits and molascuit. British Guiana is the largest producer of rum of all the other West Indian colonies, its production from pot stills alone being 12 per cent. higher than that of Jamaica. A detailed account is then given of the method of manufacturing rum.

The next three sections of the paper deal with the position in regard to balata, gold, and bauxite. In regard to gold, the writer quotes Professor Harrison as saying that the prospects for increased gold production are very good, the geological structure in many of the valleys in the vast interior being such as to make the presence of gold in large quantities highly probable. Concerning bauxite, the work of Professor Harrison is again referred to. This mineral is being extensively exploited, and the success which is attending this work is largely due to the investigations of Professor Harrison. Bauxite is mined as a source of aluminium. The mineral contains about 65 per cent. of aluminium oxide.

A large amount of space is deservedly given in the paper to a consideration of the general researches of Professor Harrison upon tropical soils. The breadth of these researches has been responsible for many important generalizations. In regard to the Government Laboratory, of which Professor Harrison is Director, Dr. Browne states that for doing the miscellaneous work recorded, which embraces almost every branch of chemistry, the laboratory is one of the best equipped which he has ever visited. In conclusion, Dr. Browne refers to the work of Professor Harrison in the following terms: 'For variety, skill, and economic value, his thirty years of scientific work in British Guiana form a record without parallel, and one of which a general paper of this kind can give but a fragmentary and imperfect picture.'

A second paper by Dr. Browne deals with his impressions of the sugar and syrup industries in Barbados. This paper appears in the *Louisiana Planter* for September 13, 1919, and is well illustrated by means of thirteen photographs. Although these photographs may give the reader an impression that somewhat primitive methods are still in vogue, perusal of the subject-matter will make it clear that many lines of the work in Barbados are progressive and up-to-date. The paper commences by describing the beginning and progress of the pioneer work with seedling canes. It is noted that sugar-cane seedlings were first discovered in Barbados in May 1858, by Mr. J. W. Parris, the proprietor of Highland plantation. Consequent on this observation, Mr. J. R. Bovell, the present Director of Agriculture, carried on his experiments with much energy and skill, and the result has been to produce varieties of seedling canes of high sucrose content, and possessing other characteristics of immense advantage, not only to the industry in Barbados, but also to that in other parts of the West Indies, and of the tropics generally. Special reference is made to one of the most recent varieties known as B.H.10(12) The average yield in sucrose per acre for this variety is about 10,500 lb. compared with approximately 6,300 lb. in the case of White Transparent, the standard cane. This is an increase in value per acre, compared with White Transparent, of approximately $100.

With regard to the experimental plots at Dodds, Dr. Browne learnt that the manurial experiments have shown that 40 lb. of ammonium sulphate and 80 lb. of potash per acre give the best monetary results. Reference is also made to the damage caused by root borers in Barbados. This is a problem of a serious character which demands co-operation amongst planters in order that these pests may be kept in check by means of widespread collection.

Dr. Browne visited four sugar factories during his stay in Barbados. The leading impression produced in all these factories was that of scrupulous neatness, the floors, walls and machinery being fastidiously clean. This condition exists in practically all Barbados factories. An account is next given of a small muscovado factory, and is followed by an account of factories where raw centrifugal sugar is principally produced. Waterford, Carrington, and Bulkeley are referred to as three factories of the more modern type, which are well equipped in every way. The use of crystallizers is not as yet general in Barbados, the first molasses being boiled and run into tank cars for second sugars. Carrington and the other newer factories are designed, however, to accommodate crystallizers, and these will soon displace the old system of cars. The output of these factories, Dr. Browne states, consists of a very clean grade of centrifugal sugar of good grain. At Bulkeley white sugar is manufactured for local consumption.

In regard to transhipment, the writer refers with some surprise to the continued employment of lighters propelled by man power. The practical observer, he states, is prompted to ask — Does it pay to do things in this primitive way of 200 years ago? The stranger who visits Barbados and sees ten men doing the work of one machine, has occasion to ask this question many times.

The next point dealt with is the different kinds of sugar and molasses exported from Barbados, and Dr. Browne has a good deal to say concerning syrup, or fancy molasses. Unfortunately, he says, but very little of the pure cane syrup, for which Barbados has a high reputation, ever reaches the northern markets of America as such. Although the Barbados Act of 1912 forbids the mixing of syrup and molasses within the island, a large amount of the syrup exported from Barbados finds its way into the hands of mixers and blenders, who, by adding to it commercial glucose or bleached vacuum pan molasses, improve the flavour of the latter. These facts are known to the manufacturers of Barbados, and a vigorous campaign has been under way for some time to prevent the good reputation of Barbados syrup and molasses from being lowered. Dr. Browne concludes: 'When the consumer becomes once familiar with the natural genuine flavour of pure cane syrup, the possibility of his ever accepting a bleached or blended substitute will be exceedingly remote.'

FUEL OIL FOR SUGAR FACTORIES.

The story of the fuel-supply for sugar-cane factories is one of steadily increasing efficiency. In the olden days the megass had to be carried by hand, and sun-dried; with the modern central factory mills, the extraction is so complete as to render drying unnecessary, and the fuel is also conveyed by mechanical means to furnaces of special construction. But with the greater power required by the most modern factories, the supply of megass has not always been sufficient. In some places, as in Louisiana, coal has been used as an adjunct; in other places wood has been employed. We are now confronted, says the *Louisiana Planter* (September 20), with what seems to be a novel idea.

There was some little comp'aint this last season that the sugar planters of Cuba did not have enough fuel, and we were led to wonder what need they had for fuel when the bagasse was competent. Thus, it gradually appeared that repeated pressures, and the considerable dilution of the cane juice by the maceration process at the mills, have given a total amount of dilute juice that it was beyond the power of the bagasse, no matter how excellent, to furnish enough steam satisfactorily to evaporate, although the evaporating apparatus had been carried on from the old double effects up to triple and quadruples. Still fuel was wanted, and it was got in the best way possible during the scarcity of shipping last year.

We now find that the Texas Oil Company contemplates the establishment of a fuel oil station at Antilla in Cuba; that the United Fruit Company has begun the erection of fuel oil tanks on its properties at Banes and Preston in Eastern Cuba. It is reported that six tanks will be erected at present by the American company, the iron work, all prepared for riveting together, having already arrived at Antilla by a steamer from New York in July, and a superintendent and competent foreman have also arrived at Antilla for the construction work.

These tanks are to be erected on the separate properties, the Banes division having two tanks of 20,000 barrels capacity each, and located at Macabi, where Central Boston, the sugar factory, is located. The head offices of the company are at Banes, and Macabi is 9 miles distant. A third tank having a capacity of 5,000 barrels of oil, will be built at Banes. The Preston division gets two tanks of 20,000 gallons capacity each, and these will be erected near the Preston central factory, and a third tank of 5,000 barrels capacity will be erected at Guaro, 10 miles away, on the company's narrow gauge railroad.

The statement is made that these two sugar factories of the United Fruit Company are perhaps the first in the district to substitute oil as fuel in place of coal, wood and bagasse, formerly used. We are led to wonder what they are going to do with their bagasse, but we know that at Preston very extensive experiments have been made in the manufacture of bagasse into paper, and that large quantities of bagasse were sent through to Wisconsin for the purpose of experimentation, and that considerable quantities of ground sugar-cane were also sent to Wisconsin as a dry fibre with the view of developing whether or not it would pay to send the sugar in that shape to the United States, for elaboration by the diffusion process in a beet sugar factory. We believe the experiments in securing sugar in this way have been found unsatisfactory, but the manufacture of paper from bagasse is one of the possibilities that perhaps has not yet been finally worked out satisfactorily, but certainly will be some time in the future. We should say that the United Fruit Company's factories will surely burn considerable bagasse, utilizing it as fuel, before they shall have learned the way to convert it into paper and make an industrial success of it. It may be that within a few years we shall find Cuba dotted with oil tanks, similar to the custom in Louisiana, where our manufacture of high-grade sugar demands the addition of some fuel, even where the use of bagasse as a fuel is made industrially successful

TOLERANCE OF SALT BY THE SUGAR-CANE.

In the editorial in the *Agricultural News* for October 18, 1919, on salt and the growth of coast-land plants no reference was made to the following results obtained in India in connexion with salinity and the sugar-cane. These results have only just come to hand, and are to be found in a paper in the *Agricultural Journal of India*, Vol. XIV, Part 3. In this paper it is shown that while salinity in large amount causes injury, the sugar-cane, and especially certain varieties, is distinctly a facultative halophyte—an opinion that was expressed in the editorial on the subject referred to above. The chief conclusions arrived at in India are as follows:—

Soft, thick, juicy varieties do not come up at all in saline land, while thin, hard and less juicy varieties come up fairly well.

Sugar-cane varieties and seedlings which do not come up well under saline conditions, come up far better under less saline conditions, and this difference in growth is traced to be due chiefly to sodium chloride.

The effect of saline irrigation is to give an impure juice, containing large amounts of chlorine and potash, and a determination of chlorine alone, which is comparatively easy, will give one an idea of the approximate quantity of the other.

The usual method of determining chlorine—evaporating the juice, igniting the same and determining chlorine in the water extract – not being found quite feasible in a field laboratory, a new method of directly determining chlorine in the juice by lime-water and alumina cream is suggested. This is found to give a correct idea of the relative quantity of chlorine in juices, and is also quicker and better adapted to a field laboratory.

The chlorine content of a variety depends upon (a) conditions of soil, water, etc., under which it is grown; (b) nature of the variety itself.

The effect of large quantities of chlorine in any juice is to lower the sucrose, purity, and glucose contents of that juice.

A large percentage of soluble salts in the juices of canes grown under saline conditions is usually associated with a low glucose content, and interferes with the crystallization of sucrose.

The inferior kind of *jaggery* obtained on the Cane-breeding Station from North Indian cane varieties is due among other factors, to the high chlorine content of the juices. Determination of chlorine in the juice would give one an indication of the relative quality of *jaggery* one is likely to get.

AGRICULTURAL REPORT, BARBADOS.

The following report on the condition of crops in Barbados was published in the Barbados *Agricultural Reporter*, for November 2, 1919.

The cane crop has been kept green by the light showers which fell between October 15 and 27. There has been a struggle for existence, but little growth. The recent rains have already started a spurt, and planters are hoping for such weather as will enable them to make a 50-per cent. crop next year In the black soil there is freedom from disease, and the bunches are fairly full. It is a matter of racing with time. St. Philip and Christ Church particularly, have held out well, but, of course, everywhere there is only a very moderate length of cane. With a forcing October the tale would have been a different one, and the fields would have shown signs of a promising harvest.

In different parts of the island accounts vary as to the staying powers of the seedlings. Of the Ba.6032 we have heard but little. Of the B. 6450 some planters still have the highest opinion, while others think of reducing the area to be put under this seedling at the approaching planting season. Some think that the B.H.10(12) has not resisted the drought as well as the B. 6450: all, however, agree that it is a seedling very rich in saccharose. We think that a smaller area will be planted of the Ba. 6032 this season than last, although it is generally felt that it yields the highest tonnage whenever it develops well It is as a ratooner that planters are doubtful of this seedling.

We are convinced that the B. 6450 and the B.H.10 (12) are the best seedlings for the red soil. If treated liberally, they will yield well, both as plant canes and as first ratoons. It is a question whether second ratoons should be regularly grown unless the soil is exceptionally good, and has been rested.

In the black soil the B. 6308 and the Ba.6032 may receive a fair amount of patronage. The B.6308 is an excellent plant cane, and will give a most satisfactory account of itself, if reaped at the proper time. With the factory system this should be possible, so long as too large an area of it is not planted.

At this date last year we referred to certain new varieties which were being advertised. These were: the Ba.11569, B.S.F.12 (24), B.S.F.12 (27), B.S.F.12 (34), B.S.F.12 (44), and the B.S.F.12 (53). On enquiry we find that none of these are as yet beyond the experimental stage. The B.S.F.12 (24) shows promise, but of this even there is as yet no certain knowledge. It would be well if planters in general would grow small plots of these seedlings, note results and report them to the Department of Agriculture. The value and characteristics of seedlings would be more quickly known, and the data thus obtained would be both useful and interesting. Work of this kind would, we think, relieve the monotony of estate routine and produce an interest in plant life. We are convinced that the habits of seedlings have not up to the present time been carefully noted. This neglect has caused many a planter to select an unsuitable habitat for a seedling which would have thriven well under other conditions. It has also frequently been the cause of the poor start which has so often been made by the B.6450

We hope the foregoing suggestions will be accepted in the spirit in which they have been written. They are the result of frequent conversations with those who we think are capable of giving advice. They are aso the result of observations of the procedure on various and manifold estates.

The planting of the crop for 1921 has already been started, and planters are hurrying all they can with tillage and manuring. During the next fortnight planting will be general, but on some red soil estates cane holes have not yet been dug in all fields. This is a pity, as the plants will make their start under disadvantageous conditions.

Sheep manure is being used extensively. Indeed two of our correspondents inform us that this manure is in greater demand this year than ever before. We knew that there would be a great shortage of farmyard manure, owing to the small fall of litter from the old crop. Planters will have largely to resort to green crop manuring if they mean to keep their land up to a high standard of fertility. They complain that labour is insufficient to collect all the bush that could be cut from the gullies and hillsides. We notice that, in St. Peter particularly, year after year the bush remains uncut. It is a pity that this should be the case, as an abundance of nitrogenous manure is thereby lost.

The yam crop suffered during October. In some fields the spires were nipped and many leaves blistered. In a recent report we mentioned that the finest spot of yams we had seen was at Cottage in the parish of St. George. To this we would add a field at the Government Industrial School, and one at the Ridge in Christ Church. Almost everywhere else the outlook for the next crop of this vegetable is decidedly moderate.

Potatoes, which are very scarce in some districts, are somewhat cheaper than they were at the date of the last report. In St. Lucy's parish they are being retailed at 5 lb. for 10c. The general price however, is 3c. per lb. We were glad to find on several estates gangs busy with the planting of this vegetable on the morning after the rain of October 27.

The first field of white eddoes which has come under our notice is at Bushy Park in St. Philip's parish. The nut eddoe, a very wholesome and nourishing food, does not seem to be planted as generally now as was the case years ago.

The worm has been very busy of late. Potatoes, corn, woolly pyrol, and the cucumber and squash vines have all been attacked, and in one or two instances we have noticed that the blades of canes had been eaten. We are pleased to be able to state, however, that no material loss has been sustained as far as the potato crop is concerned. The fields attacked were practically ready for the market.

Dark crystals are now being purchased at $8·00 per 100 lb. for deliveries up to July next year.

DEPARTMENT NEWS.

Information has been received at the Head Office to the effect that Sir Francis Watts, K.C.M.G., Imperial Commissioner of Agriculture for the West Indies, has left England, and is expected to arrive at Barbados on or about November 16, 1919.

The Imperial Commissioner proceeded to England on duty leave in June last, and has, during that time, been actively engaged in official matters, including the question of the proposed establishment of an Agricultural College in the West Indies.

MANURIAL VALUE OF COTTON BUSH.

The following results have been obtained in St. Kitts by Mr. R. E. Kelsick, Chemical Assistant in the Agricultural Department. These results will appear in due course in the Report on the Agricultural Department for 1918-19, but owing to their particular interest, it has been decided to publish them at once in the *Agricultural News*, without waiting for the appearance of the report:—

The practice of burning the remains of cotton plants left on the land after reaping has been, and still is a general one in the cotton-growing islands in the West Indies, with the exception of St Kitts, where the bushes have always been buried under the banks.

The reason for burning, which is enforced by law in all West Indian cotton-growing islands except St. Kitts and Nevis, was the eradication of insect and fungoid pests, but in a paper by the Agricultural Superintendent, St. Kitts-Nevis, 'Notes on the destruction of cotton bushes by burning' (*West Indian Bulletin*, Vol. XV, p. 319), it was pointed out that at La Guérite Experiment Station, where cotton was grown continuously, burying the bushes had been done instead of burning for some years, with no increase of disease, and a change from burning to burying was strongly advocated.

The following notes have been written to show to what extent the fertility of the soil is being depleted in those islands where cotton bush is destroyed by burning.

In 1918 the bush remaining on the no-manure and pen-manure plots of the cotton manurial experiments was weighed after the crop had been reaped, with the following results :—

	No manure.	Pen manure.
Series 1	159½ lb.	234½ lb.
„ 2	148 „	254 „
Mean	153½ „	244½ „
Per acre	6,140 „	9,780 „

This amount of organic material might be considered small, but in tropical countries where the decay of organic matter is very rapid and the supply of organic manures usually inadequate, any material which will help to maintain the humus content of the soil is valuable. It will therefore be seen that by burning the bushes there is an appreciable loss of useful material every year.

The amount of nitrogen, phosphoric acid, and potash present in an average sample of this material was determined, and the following figures obtained :—

Nitrogen	2·16 per cent.	
Phosphoric acid	1·40 „ „	(on air-dry material)
Potash	2·33 „ „	

These figures, show that the bush has a high manurial value, and although some consideration must be given to the fact that it is returned to the land in a very undecomposed state, yet its value as a supply of potential plant food cannot be questioned.

The amount of manurial constituents removed annually from land yielding at the rate of 1,000 lb. of seed-cotton per acre would be about as follows:—

Nitrogen	26·32 lb. per acre
Phosphoric acid	12·67 „ „ „
Potash	11·96 „ „ „

In computing these figures use has been made of the figures given in the *West Indian Bulletin*, Vol. V, p. 225, for the composition of Sea Island cotton seed.

The amount of manurial constituents returned to the soil by burying the remains of the plants would be about as follws:

Nitrogen	171·9 lb. per acre
Phosphoric acid	111·44 „ „ „
Potash	187·1 „ „ „

It will therefore be seen that the amounts of nitrogen, phosphoric acid, and potash returned to the soil by burying the old plants are greatly in excess of those removed in the seed and lint.

Consideration of the foregoing facts makes it evident that the practice of burning remains of cotton plants is detrimental to the fertility of the land. In the first place there is the loss of an appreciable amount of organic material, so essential for maintaining the fertility of tropical soils; and secondly, the land is deprived of a valuable supply of nitrogen.

The continuation of the practice must eventually lead to a state of unproductiveness, especially in the case of light soils, unless ample supplies of organic manures are available for application to the land.

NEW FACTS CONCERNING HEVEA RUBBER.

In the following extract, taken from the *India Rubber Journal* for August 2, 1919, two subjects are dealt with: in the first paragraph the subject is the effect on the tree of change in tapping surface ; in the second, laticiferous vessels in Hevea, and their structure.

It has been frequently contended that much of the variability in plantation rubber is due to the difference not only in the age of bark tapped, but to the differences in intensity of tapping. The effect of a change in tapping surface on latex and rubber has been discussed by Dr. O. De Vries in the April issue of the *Archief Voor de Rubber Cultuur*. It is obvious that when a new tapping surface represents an area which has been rested for some time, latex extracted therefrom will show a high percentage of caoutchouc. There is bound to be a great difference in the composition of latex from the first cut on a rubber tree, and that obtained from the first cut on primary bark of a tree, say, ten years old. There is also a further effect when a change of tapping surface is accompanied by a change of tapping system ; under such conditions there is bound to be a wide variation in the composition of the latex collected. Dr. De Vries shows that the percentage of caoutchouc in latex obtained from old and new surfaces varied from 20·7 to 26·1 per cent., and similarly the time of curing varied from 101 to 110.

The exact area drained by one or more tapping lines on Hevea trees has never yet been determined. It is clear, however, that a tapping cut will drain an area only if there is an intimate connexion between the vessels containing latex. It may have been forgotten by many people that the latex vessels of Hevea are formed as a result of the breaking down of normal cells; time is therefore necessary before communication between the vessels can be well established. Dr. W. H. Arisz has given a further communication on the structure of the vessels in the April issue of the journal already mentioned. He finds after having examined the bark on trees varying from five to ten years old, that the various concentric layers of latex vessels in the stem are connected with each other. He also finds that vessels frequently show double bifurcations which render the communication of one series of vessels with another more complete; these particular vessels often reach a great length. At the base of Hevea trees there

are a large number of concentric layers in communication with one another. With lateral branches the number of the laticiferous layers apparently depends largely upon age. According to Arisz, the latex of secondary and tertiary lateral branches cannot be drained by the tapping cut, because such branches have only one laticiferous layer left, which is not in communication with similar layers in the stem. It is perhaps difficult to reconcile this point with a further conclusion by Arisz, to the effect that latex from a tapping cut at the base of the tree may come either from the stem, the main root, or from lateral branches possessing several latex vessels in communication with others.

REMARKABLE YIELDS OF SWEET POTATO IN MONTSERRAT.

During 1912-13, fifty-one varieties of sweet potato were growing in the experiment plots at the Botanic Station, Montserrat. The yields obtained showed so great a degree of variation, and the average was so high, that it has been thought likely that a reference to these may be of interest to readers of this Journal at the present time.

The variety heading the list was Red Bourbon. This gave a calculated yield of 30,250 lb. per acre. The lowest yielding variety was Duckfoot, giving only 3,509 lb. per acre, or almost ten times as little. Barbados Barrel, a well-known and popular variety, yielded at the rate of 18,573 lb. per acre.

The frequency of the different yields may be expressed as follows:—

Yield (lb.).			Number of varieties coming within the ranges opposite.
Between 35,000	and	30,000	1
,, 30,000	,,	25,000	7
,, 25,000	,,	20,000	11
,, 20,000	,,	15,000	20
,, 15,000	,,	10,000	8
,, 10,000	,,	5,000	3
,, 5 000	,,	nil	1
		Total	51

This shows that under the conditions of this experiment, most strains may be expected to yield from 15,000 lb. to 20,000 lb. per acre. It shows that a 30,000 lb. yield is exceptional. The average yield of this variety, Red Bourbon, for fifteen years' experiments is 13,821 lb., whilst the most frequently occurring yield amongst all varieties is about 12,000 lb.

Such figures would seem to indicate that there was something exceptional in the conditions of the 1912-13 experiment. Mr. Robson, Curator of the Station, who had charge of the experiments, writes as follows: 'The crop previous to the preparation of the land for the potatoes was ground nuts. Ordinary banks were formed 4 feet apart, each row being 90 feet in length. Cuttings of the sweet potato varieties were planted on November 5, 1912, 2 feet apart. The crop was reaped on April 24, 1913.

The rainfall from the date of planting to reaping was: November, 7·61 inches; December, 6·05 inches; January, 8·31 inches; February, 2·95 inches; March, 5·82 inches; to April 24, 3·39 inches. Total 33·95 inches.

These figures show that the rainfall was heavy and well distributed, and is probably the chief factor responsible for the high yields obtained. The yield of Red Bourbon at the rate of over 30,000 lb. per acre is nevertheless remarkable, and certainly points to the great capabilities of this variety as a heavy yielder under wet conditions.

JIPPI-JAPPA.

Jippi-Jappa is the South American name for the plant from which the straw is obtained to plait the well-known Panama hats. This plant is a native of South and Central America, but has recently been introduced successfully into some of the West Indian islands, where it is hoped that hat making may become a minor industry, especially suitable for women in their homes. In British Guiana the art is already taught in some of the girls' schools, the material being supplied from the Botanic Garden and the Experiment Station. In Jamaica the manufacture of hats from Jippi-Jappa straw has attained some dimensions. Plants of Jippa-Jappa introduced into Grenada by the Agricultural Department are now doing well, and it is expected that soon the art of plaiting hats locally will be taught.

Apart from its industrial value, the Jippi-Jappa plant (*Carludovica palmata*), is interesting from a botanical point of view. It is often spoken of as a palm, although it really belongs to the order Cyclanthaceæ, an order which seems to be a link between the screw pines (Pandanaceae) and the arums. In appearance, however, it is very like one of the palmate-leaved palms, producing a clump of leaves with stalks 6 feet to 8 feet long, each leaf being from 3 feet to 4 feet in diameter. The ribs of these leaves are removed, and, after a process of curing, the leaves are cut into strips, from which the hats are plaited.

Recent Exports from St. Lucia.—The following figures show the quantities of various produce shipped from St. Lucia for the periods indicated :—

	1919. From Jany. 1 to Sept. 15.	1918. From Jany. 1 to Sept. 15.
Bay oil (galls.)	435	175
Cacao (cwt.)	7,977	28,586
Coco-nuts (number)	121,293	73,967
Copra (cwt.)	114	107
Honey (lb.)	39,600	35,100
Limes (brls.)	2,596	508
Lime juice, raw (galls.)	386	—
,, conc'td. (galls.)	5,140	8,707
Lime oil (galls.)	215	454
Logwood (tons)	354	490
Molasses (galls)	14,080	24,740
Rum (p. galls.)	—	—
Sugar (cwt.)	71,151	52,971
Syrup or Fancy molasses (galls.)	27,193	12,050

The large increase in the exports of coco-nuts, and of sugar and fancy molasses, will be observed.

An announcement appears in the *Leeward Islands Gazette* for October 16, 1919, to the effect that His Excellency the Governor has been pleased to appoint Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts-Nevis, to be provisionally an official member of the Legislative Council of St. Kitts-Nevis

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*

Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with West Indian fish supplies, and indicates the steps that might be taken to increase the local production.

An article, which describes the impressions of an American chemist in regard to the sugar industry in Barbados and British Guiana, will be found at pages 354 and 355.

An interesting article on the manurial value of cotton bush appears at page 358.

Insect Notes in this issue deal with entomology in Porto Rico.

River Estate, Trinidad.

The recent convention of planters at the Government Experimental Estate in Trinidad appears to have furnished an excellent refutation of certain adverse criticisms lately made in regard to the value of the work carried out there. Mr. H. C. Warner said it was hard to suggest any experiments more useful than those being conducted by the excellent and efficient staff, while Mr. Edgar Tripp stated that they all appreciated the interesting work being carried out, and the hospitality extended to the visitors that day.

The report of this meeting, which appears in the *Port-of-Spain Gazette* for October 18, 1919, goes on to refer to the experiments in progress. In the first place mention is made of the projected improvement of the coolie barracks, and the arrangements made for the cultivation of provision crops on adjacent lands. In regard to the experiments proper, reference is made to the field record of individual cacao trees. These show individuality in cacao in a striking manner. Of perhaps still greater interest to planters were the 'shade' and 'no-shade' experiments. At present it appears that 'no shade' gives the better results. In addition to these, there were to be seen the distance planting experiments, and the experiments in budding, both which have yielded useful results.

Opportunities for New Settlers in the West Indies.

From a purely British standpoint, the more rapid development of the tropical colonies is desirable in two directions: first, it would mean an increase in the supply of raw material for home consumption and manufacture; secondly, it would mean good openings for British capital, and possibly for British settlers also.

From most British points of view the first is far more important than the second, though this appears to be overlooked recently by the *West India Committee Circular* in an article dealing with West Indian development.

That publication is very optimistic as regards the openings for intending settlers in the West Indies, and gives quite a misleading interpretation of a recent lecture on the subject by Sir Francis Watts.

The Financier for October 13, 1919, contains a more complete report of the lecture, which was delivered in London under the auspices of the West India Committee and Overseas Club. Reference to this will make it clear that Sir Francis Watts was merely cautious on a subject that has in the past led others into disrepute through their being unduly optimistic.

While it is true that there are very large areas of land available for settlers in the West Indies, it is also true that the communications are often inadequate, and generally speaking, so is the labour-supply.

As Sir Francis Watts pointed out, the West Indian colonies are composed of settled communities. Most of the land worth cultivating without large expenditure of private and public money has been

taken up, and all such land just now is abnormally high in price. There is land to be bought cheap; but any sound and honest adviser who understands conditions is bound to adopt a cautious attitude in advising Europeans to settle in the hinterland of British Guiana, or in the interior of Dominica. For this reason, the lecturer referred principally to matters of production in the different colonies, indicating in what direction most progress is being or should be made.

There is no reason, however, why a more vigorous policy should not be pursued in order to improve the internal communications of the large and relatively undeveloped colonies. As soon as this is done, and as soon as a scheme is discovered whereby the labour-supply can be augmented—then will be the time to encourage, as a general policy, fresh Europeans to take up agricultural land in the West Indies.

Skunks and Toads—A Warning.

In the Insect Notes in the present issue of this Journal, reference is made to the introduction of the toad and the skunk into Porto Rico, for the purpose of controlling white grubs, larvae of the several species of brown hardback beetles, that are causing such serious injury to sugar-cane in that island.

The reference to the toad of the American continent in comparison with the tree frogs of Porto Rico, would indicate that the toad (*Bufo marinus* or *B. agua*) does not occur in that island. In the Leeward and Windward Islands, in Barbados, and in Trinidad, it is established, and is fairly common.

The North American skunk (*Mephitis mephitica*) is a terrestrial, fossorial, carnivorous animal, nocturnal in habits, and feeding principally on insects, small mammals and reptiles. There would seem to be no doubt that if skunks were established in these islands, they would do a great deal of good in killing many injurious insects, and rats and mice; they might even kill the mongoose.

From what is known of the habits of skunks in their natural environment, there is no indication that these animals would become serious pests in the way the mongoose has. It is generally believed that the West Indies have suffered from the ill-advised introduction of the mongoose, and it is only fair to sound a note of warning in this connexion.

It is known, however, that the skunk sometimes becomes a nuisance to the poultry keeper by eating eggs, killing young chicks and even fowls; but this does not happen to such an extent as to cause serious losses.

The introduction of any carnivorous mammal into the restricted area of any of the small islands of the West Indies may have a more far-reaching effect than can be foretold. If the skunk should be established in one of these islands and then a shortage of its natural food should be experienced, there is no knowing just how it would adapt itself to its changed environment.

A Forthcoming Local Exhibition in Barbados

The particulars of a local agricultural exhibition to be held at Blowers Plantation, St. James, on December 3, 1919, have recently been issued. This exhibition should not be confused with the general agricultural exhibition to be held at a later date in the same month in Bridgetown.

The prize list is an extensive one, and is designed for peasant proprietors and school children. Prizes are offered for the best exhibits of all classes of live stock, and of vegetables and fruit.

The most interesting and unique feature, however, is involved in Class VIII, Class IX, and Class X. In these, prizes are offered for the best exhibition of manual work performed by school children; for example, digging cane holes, making sweet potato beds, draining land, and the like. As well as to the children, prizes are offered to the Head Teachers of the Elementary Schools for the best kept school garden, for the best collection of plants, for the largest number of boys from one school entered in Class VIII. This latter innovation is a shrewd method of stimulating the interest of the teachers, with the indirect result of increasing the number of children's entries and, as well, the quality of the exhibits.

Making Farmyard Manure without Animals.

An important discovery which may find application under tropical conditions is referred to by Dr. E. J. Russell, F.R.S., in his report on the Rothamsted Experimental Station, 1914-19, published in the English *Journal of the Board of Agriculture* for August 1919. He says:—

'Two years ago there seemed in England a prospect of a considerable surplus of straw, and methods of utilization were examined; in particular, the possibility of converting it into a useful manure was studied at Rothamsted. The prolonged drought of the present 1919 season has dispelled any prospect of excessive straw, but the value of the work remains.

'The investigation is being carried out by Dr. Hutchinson, and is the logical continuation of work that he has had in hand for some time. Laboratory work has shown that the breaking down of the material of straw, the so-called cellulose, is effected by a remarkable organism which had eluded all previous investigators, but which Dr. Hutchinson succeeded in obtaining in pure culture so that he cou'd study its properties. In order that it may bring about the decomposition of straw, it required two conditions: air, and soluble nitrogen compound, as food. If either of these is missing it ceases to act. Moreover, it will only attack cellulose: it is unable to feed on sugar, starch, alcohol or any organic acid yet tried.

'Given, however, the necessary nitrogen compounds and a sufficiency of air, the organism quickly decomposes straw, breaking it down to form a black, sticky material, looking very much like farmyard manure. A ton of this material is now being prepared for the purpose of fertilizer tests.'

INSECT NOTES.

ENTOMOLOGY IN PORTO RICO.

The Annual Report of the Insular Experiment Station of the Department of Agriculture and Labour of Porto Rico, for the period July 1, 1917 to June 30, 1918, contains a review of the entomological work carried out by the Experiment Station since its establishment in 1910 by the Sugar Producers' Association of Porto Rico. In 1914 this station was transferred to The People of Porto Rico, and for three years it was administered by the Board of Commissioners of Agriculture (1914-16 inclusively), and in 1917 it became a part of the Department of Agriculture and Labour.

The report of the Division of Entomology for the year 1917-18 records principally, the work on the pests of sugar-cane. In addition, there is an account of a rhinoceros beetle attacking coco-nuts. A number of young coco.nut trees were seriously injured by the adults of this large beetle. Older trees are sometimes attacked also. The larvae of these beetles live in rotting wood, and the adults are attracted to the rotting husk of the seed coco-nut at egg-laying time and find their way to the green leaf-bases, through which they tunnel into the growing centre of the stem, sometimes killing the plant, and often seriously injuring it.

The remedy suggested for the control of this beetle is based on the attraction of the adults to rotting wood. It consists in the collection of the trash, dead logs and stumps, which accumulate in coco-nut plantations into piles distributed through the groves to attract the beetles at egg-laying time. These piles should be turned over and examined monthly, and all grubs and beetles found in them destroyed.

Among miscellaneous insects dealt with in the report are the horn fly (*Haematobia serrata*, Desv.), garden pests, certain scale insects, and white-ants.

The horn fly seems to be on the increase. An attempt was to have been made to introduce a scarabeid beetle from Santo Domingo to help to control the horn fly, but on account of the conditions incident to the war, it could not be done. This beetle, *Canthon violaceus*, belongs to the dung-rolling class, which are active agents in the quick disposal of cattle dung, and thus prevent the hatching of flies—the eggs of the horn fly are deposited in cattle dung and the larval and pupal stages are spent there. Such beetles are said to be totally lacking in Porto Rico.

Hedges of orange jessamine (*Murraya exotica*) were attacked by the California red scale (*Chrysomphalus aurantii*), the citrus purple scale (*Lepidosaphes beckii*), and the brown shield scale (*Saissetia hemisphaerica*). Peanuts were attacked by an undetermined species of mealy-bug (*Pseudococcus* sp.), which was attended by a large brown ant (*Prenolepis* sp.).

Sugar-cane cuttings used for planting were attacked by wood ants (*Eutermes morio*). These attacks resulted from leaving the cuttings on the ground for some time, and they were infested before planting.

The tables showing the results of Plant Quarantine Inspection give interesting information in regard to the source from which plant material of all kinds are received at the several ports of entry, and particulars as to the insects intercepted in the course of this work.

A rigid quarantine was maintained as in previous years against the importation of all citrus nursery stock, or citrus fruits or seeds from the United States, and from foreign countries and islands, on account of the much dreaded citrus-canker, and also on account of such insects as the white fly, the black fly, the Mediterranean fruit fly, and the Mexican orange maggot, none of which occur in Porto Rico. The insular laws require that no fruits from other tropical countries shall be introduced. A new regulation promulgated in February 1918, by the Commissioner of Agriculture and Labour, prohibits the importation of pine-apple fruits or slips from all foreign countries or islands, on account of the recently discovered pests and diseases found to occur in Jamaica, Hawaii, and the Philippine Islands.

The mottling disease of sugar-cane is one of the most serious troubles of the sugar planter in certain districts in Porto Rico. The means by which the disease is spread and communicated to healthy plants is not known, and the possibility of this transmission being due to the action of insects is under consideration. The insects which are under suspicion are a green leaf hopper (*Tettigonia similis*), and the sugar-cane shot borer (*Xyleborus perforans*). The leaf hopper occurs in Para grass in the traces between cane fields, and to some extent on young cane, and is often encountered where the disease is spreading. The shot borer was found abundantly in decaying stalks under ground in a field which had been badly attacked by the disease, and in a district where the disease was spreading rapidly.

The problem of white grub control is also a most serious one. The white grubs of sugar-cane fields in Porto Rico are similar and closely related to the brown hardbacks which are serious pests in Barbados and Antigua. They have been increasing in importance in Porto Rico for several years past, and recent studies indicate that there are at least five species concerned in the attacks on the roots of sugar-cane plants.

In two districts where the white grubs have not attracted attention until the previous year or two, they were so numerous during the 1917-18 period under review, that on one estate in a single season over a million beetles and grubs were collected, and some growers assert that if the white grubs continue to increase in these districts, cane growing will cease to be profitable.

The only reliable and economically paying method of control of white grubs yet devised is the hand collection of grubs and beetles, which is costly and laborious and serves at best only as a palliative. In spite of all efforts at collection, white grubs are on the increase, and it is evident that there is great need of some better and cheaper means of white grub control in sugar plantations.

'A better and more economical means of white grub control which has suggested itself to the writer, is the permanent introduction into the island of two species of animals from the mainland that live almost exclusively upon insects, and are known to eat large numbers of white grubs and May beetles. These are the skunk and the toad. Both of them are distributed over a wide range of climate on the North America continent from Canada to Central America, occurring as different species and races, and both are absent on this island and might be readily acclimated if introduced here artificially. Both of these are nocturnal in habits, and would therefore do their foraging at a time when the May beetles (*calculos*) are active.

'The skunk is an animal about the size of the mongoose, but quite without its bloodthirsty taste for eggs and young birds. It protects itself from its enemies by the ejection of an offensive smelling liquid on its pursuer; and this would serve to protect it from slaughter by either man or the mongoose. It is almost wholly insectivorous, and has been known to root up the soil over whole acres of grass land in

the States in search of white grubs, of which it is very fond. The pelt of the skunk is valuable, and for that reason numerous skunk farms are conducted in the States for the purpose of raising skunks. From these, pairs of skunks could be easily purchased for introduction into Porto Rico. The entomologist has had considerable correspondence with the Chief of the Biological Survey in Washington, D.C., and learns from him that the introduction of skunks into the island is wholly practicable, and that the life history of the animal as known in the United States, does not justify any fears that it may in any way become a menace to agriculture on the island, as was the case with the mongoose.

'The toad of the American continent is a reptile of the amphibian class; that is, half of its life is spent in the water as a tadpole, and the other half on dry land as a toad. The length of time spent as a tadpole may be only a few weeks, while its age as a toad may be ten years or more. Tadpoles are reputed to be active agents in the riddance of mosquito wiggletails from stagnant water, and are therefore beneficial. The adult toad is not unlike the tree frogs of Porto Rico in appearance, but is very much larger, being often a half-foot or more in length of body. It is therefore able to devour far greater quantities of insects than our tree frogs, and would readily devour insects the size of May-beetles where the native tree frogs do not. Toads are very inoffensive creatures, hiding in grass or rubbish during the day, and coming forth each night to visit the same feeding grounds to devour night-flying insects. They require but two things for existence, insects and water, both of which are plentiful on the island.

Toads could be very easily introduced by bringing to the island the large egg-masses that are at the margins of pools in the States and in Mexico, where toads are important factors in insect control.'

An attack of black hardbacks (*Dyscinetus trachypygus*) was reported in 1917, when it was found that the adult beetles were attacking the roots of sugar-cane, as many as twenty to thirty being dug from a single cane stool, and many stools had been killed. The larvae live on decaying vegetable matter.

An attack of red spider was noted on the leaves of sugar-cane in a plant house where the temperature was several degrees higher than outside. The red spider did not cause a serious attack outside the greenhouse. It occurred on both the upper and under sides of the leaves, forming a light webbing over the surface, particularly near the midrib, and causing by the extraction of the chlorophyll an appearance very similar to that produced by the mottling disease.

Young seedling canes were attacked by the yellow cane aphis (*Sipha flava*). Trials with insecticides have led to the conclusion that no advantage is derived from spraying with contact insecticide, This pest is well controlled by its natural enemies, which include several lady-bird beetles, a chrysopid fly, several syrphid flies, and at least one internal hymenopterous parasite.

CONTROL OF EAR TICKS.

Ear ticks infesting cattle cannot be eradicated by dipping or spraying, but they may be controlled, and the loss they cause prevented by injecting the ears with the mixture described below. This information is taken from *Farmers' Bulletin* No. 980, United States Department of Agriculture, entitled 'The Spinose Ear Tick' by Mr. Marion Jones.

An effective remedy against ear ticks was formulated by the Bureau of Animal Industry and thoroughly tested during its field investigations. This remedy consists of a mixture of 2 parts by volume of ordinary commercial pine tar, and 1 part by volume of cotton seed oil. In mixing the ingredients add the cotton-seed oil to the pine tar and stir until a uniformly smooth mixture is obtained. When the weather is cold, the pine tar and cotton seed should be warmed so that they will mix readily and flow freely, but they should not be heated more than is necessary. The mixture will remain uniform for a long time without separation or deterioration. It is relatively inexpensive, easy to prepare, and when properly applied, it kills the ticks but does not injure the animals. It may be used on any species of domesticated animals.

Cotton-seed oil is a fairly good solvent for earwax, and the mixture penetrates ordinary loose masses of earwax and ticks, but it will not penetrate the hard masses. It not only kills all ear ticks with which it comes in contact, but being of a sticky consistence, it remains in the ears and protects the animals against reinfestation for about thirty days.

An ordinary metal or hard rubber syringe holding from one to 2 oz. is the best instrument to use for injecting the pine-tar-cotton-seed-oil mixture.

ACCIDENT TO A DOG WITH A FRUIT CASE.

The Brazil nuts of commerce, *Bertholletia excelsa*, are, as most people are aware contained in a hard fruit case, spherical in form, which has four cells, each containing six or eight of the nuts, which are indehiscent. These cases are in some instances as large as a man's head. The tree Bertholletia (order Lecythideae) is, of course, a native of tropical South America.

The subject of this note was an Airedale terrier, and its owner, after extracting the nuts through an opening made in the apex of the case, gave the empty case to the dog to play with.

One day, when playing with it, the dog's lower jaw became firmly wedged in the opening alluded to, and he was unable to withdraw it, and this was not possible until the dog had been put under a general anaesthetic (A.C.E.), and the case sawn through across the middle and down the two sides—the case being wedged firmly behind the lower canine teeth. An idea of the size of the case is given above; its weight is 8 oz.

It is regretted that the absence of a camera at the time of operation has rendered it impossible to show the case *in situ*. (From the *Veterinary Record* for August 16, 1919.)

A note appears in the *Wealth of India* for June 1919, dealing with a novel form of co-operative society for improving the fishing industry in the Aran Islands. By an important rule, individual members are bound to sell all fish to the society, and the society is bound to buy all fish caught by the members. On the society's side it is provided that the fish must be delivered in good condition, and at times warranted by market conditions. Due provision must be made, before paying for fish, for all working expenses, interest on and reduction of loan capital, depreciation of property, the creation of a reserve fund, and other charges incidental to the business of the society. In case of failure to accept fish, the society must pay £1 by way of damages to the injured member; and the member who without the committee's written consent disposes of his fish except to the society, must similarly pay £1 to the society.

GLEANINGS.

According to *United Empire* for August 19, 1919, it is the intention of the Jamaican Government to spend £120,000 on rolling stock for the island's railway system It has been decided to purchase seventy cane-cars, forty box-cars, and five locomotives. The money required will be raised locally.

Recent reports, says the *United Empire* for August 19, 1919, show that Mauritius is making a rapid recovery from the effects of the war. Steamship services have greatly improved. Since April, the crops, which were rather backward earlier in the year, have come on splendidly, and good yields of maize and cassava are predicted. The sugar-cane harvest promises to be the largest one on record

The plant known as the pink lotus (*Nelumbium speciosum*), is well known in the West Indies as an aquatic plant of attractive appearance. According to the *Bulletin of the Department of Agriculture*, Federated Malay States, the seeds of this plant, which are contained in a large capsule, have a pleasant flavour, and are eaten raw when immature, and roasted when ripe, by the Chinese in that country.

In the *Garden's Bulletin*, Straits Settlements (July 4, 1919), reference is made to an introduced species of Hevea from British Guiana. This is known botanically as *Hevea confusa*, and differs in many respects from *H. brasiliensis*. The latex, for instance, was found to be yellow, meagre in amount, and to remain tacky, with little elasticity. After material had been obtained for identification, flowering specimens of *H. confusa* were destroyed to prevent hybridization.

Attention is given in the *Journal of the Royal Society of Arts* for July 18, 1919, to the mangrove bark resources of the Philippines. Altogether there are twenty-one species of mangrove found in the Philippine swamps, two more than are found in Borneo. The tanning content of the Philippine bark is stated to run from 12 to 35 per cent., and to be, on an average, quite as satisfactory as that of the Borneo mangrove. It is suggested that the large areas of mangroves should be exploited.

A novel ensilage chute is described in the *Journal of the Department of Agriculture of Victoria* for May 1919. Instead of leaving port holes in the walls of the silo, a farmer in South Africa has devised an ingenious chute for sending the silage to the ground. Plans of this chute are given. The silage, taken from round the edges of the silo first, is thrown with a broad shovel against the back of the chute, and rapidly falls to the bottom, whence a truck takes it to the mixing floor. As the surface of the material descends, the short boards are taken from the front of the chute so that there is no lift at any time in emptying the silo.

It is reported in *Botanical Abstracts* for April 19, 1919, that dilute solutions of nitrates, on being exposed to sunlight, undergo conversion from nitrate to nitrite. On immersing green leaves in the solution, comparatively little nitrite accumulated, due, the author concludes, to the fact that the leaf absorbs the nitrites as they are formed, thus indicating that the early stages of synthesis of nitrogenous compounds are carried out in the green leaf, aided by sunlight

An interesting discovery of diamonds was made in the Gold Coast early in February last by the Director of the Geological Survey. The stones occur in shallow quartz gravels of the Abomo stream and adjacent ridge of the Birrin River. All the stones found up to the present are small, but most of them are of good quality. Upwards of 600 diamonds have been found by panning during the time the surrounding locality was being tested with regard to the origin and distribution of the diamondiferous gravels. (*The Board of Trade Journal*, August 14, 1919)

According to the Annual Report on the Elementary Schools, St. Vincent, for 1918-19, the teaching in agricultural subjects is reported on as being along more practical, and less 'bookish,' lines. A scheme was drawn up, in consultation with the Agricultural Superintendent, for improving the teaching of this subject, but, for financial reasons, was not practicable at the time. Arrangements have now been made to bring it into force, and it will soon be working with, it is hoped, better results to the training of pupils and teachers alike in agriculture.

One of the principal recommendations of the Conjoint Board of Scientific Societies of Great Britain (Second Report, 1918) is that the British Government bring before the notice of the Indian Government, and of the various Dominion Governments, and of the governing bodies of the Crown Colonies, the necessity for a close systematic investigation of all reasonably promising water powers, and of their economic possibilities. In this connexion it may be noted that the Bureau of Electrical Exploitation, Tokio, has issued a pamphlet dealing with the recent water-power survey of the Japanese Government. This is a most extensive survey, and its methods might well be studied by the survey departments of other countries. Further reference to the matter will be found in the *Indian Trade Journal* for July 18, 1919.

SOME ACHIEVEMENTS OF THE ST. CROIX EXPERIMENT STATION.

Dr. Longfield Smith, Agronomist-in-Charge, Experiment Station, St. Croix, United States Virgin islands has recently published the following statement indicating the most important things accomplished at the Station during the past few years :—

Large numbers of new varieties of cane have been raised and tested at the Station, and of these one variety, namely S.C.12/4 which has taken a conspicuous place in these experiments, has been raised on a large scale and distributed to the plantations. There are already growing in the island more than 50 acres of this cane. Last year we distributed at the Station more than 150,000 cuttings.

The results obtained on the plantations gave an average of more than 50 per cent. increase in the quantity of sugar per acre above that produced by the standard canes of the island. These facts can be verified by application to the managers of the estates where this cane was grown—namely Mt. Pleasant, Hogensborg, Sion Farm, and Bonne Esperance. At St. Johns plantation there are two large fields of this cane close by the roadside which will repay investigation. In spite of lack of weeding and moulding in these fields, the canes are quite remarkable. Had the fields been better weeded and moulded the results would have been, I venture to say, at least 20 per cent. better.

A cane which can add even 25 per cent. to the crop of this island is worth to the planters annually, reckoning a normal crop at 10,000 tons, and the value of the sugar at $120 per ton, the large sum of $257,000 a year.

Judging by the results obtained hitherto, this seems a conservative estimate of what S.C.12/4 is likely to accomplish for this island.

Contrast this sum with the modest $8,000 spent annually on the Experiment Station.

A large amount of work has been in improving the Sea Island cotton of St. Croix by breeding and selection

The results are plainly evident to day in the quantity and quality of the cotton produced on estates where the seed has been supplied by the Experiment Station.

By selection and breeding, the Experiment Station has so far improved the quantity and quality of maize which can be raised in the island, that from being an unprofitable crop, hardly ever grown, we now find every planter and nearly every labourer planting our improved maize seed and getting remunerative returns.

All the planters and labourers in the island have been benefited by this work.

Soon after the Experiment Station was started, several new varieties of sweet potatoes were introduced, and one of these, namely 'Black Rock', has practically doubled the yield of potatoes in the island, and displaced nearly every other variety. The parties benefitted here are principally the labourers As regards sugar-cane planting methods, experiments at the Station have proved conclusively that the best distance to plant is 4 feet by 2 feet instead of 4½ feet by 3 feet, which is usually practised. Planting with nothing but sound pieces of cane would add at least 25 per cent. to the crop of the island.

THE PORTO RICO AGRICULTURAL COLLEGE.

In view of the steps which are being taken to establish in the near future an agricultural college in the British West Indies, the account of the College of Agriculture and Mechanic Arts in the Annual Catalogue and Announcement (1919-20) of the University of Porto Rico, may be of interest to readers of the *Agricultural News*.

The college originated with the organization of the University in 1903. It was at first an agricultural school located at Rio Piedras. In 1911 it was reorganized under its present name, and transferred to Mayagüez.

The University funds, out of which the Agricultural College is supported, are stated to be derived from the following sources :—

(1) The University Fund. The sources of this fund are (a) all escheated inheritances in Porto Rico; (b) 50 per cent. of all fines imposed by the courts of Porto Rico, which are paid into the Insular Treasury, except those imposed for cruelty to animals; and (c) royalties from all franchises and public rights. This fund is available for current expenses, repairs of buildings, and general expenses of operation.

(2) The Permanent University Fund. Twenty-five per cent. of the sale of all public lands is converted into this fund. Seventy-five per cent. of the income from this fund is available for the payment of current expenses, the purchase of equipment, or the construction of buildings. The remaining 25 per cent. must be reinvested in suitable securities.

(3) The Morrill Fund. Under the provisions of the Morrill Act the sum of $50,000 is furnished annually by the Federal Government for instruction in agriculture and mechanic arts.

(4) Annual appropriations by the Legislature of Porto Rico.

(5) Tuition, laboratory fees, farm and miscellaneous receipts.

The following estimate of a year's attendance is believed to be about the average:—

Tuition	...	Gratis
Medical fees	...	$ 1·50
Laboratory fees	...	3·00
Books	...	15·00
Board, 9 months at $22	...	198·00
One uniform (military)	...	10·00
Total expenses	...	227·50

As regards the collegiate courses, during the first year the following subjects are studied: English, Gardening, Chemistry, Poultry, Soils, Entomology, Pedagogy or Elective.

During the second year: Agricultural Chemistry, Citrus Culture, Breeds and Judging, Feeds and Feeding, Botany, Drainage, Political Economy, Commercial Law, and Entomology.

Third year: Plant breeding, Tropical crops, Veterinary Science, Agronomy (fertilizers), Farm Management, and Electives.

Last year: Tropical crops, Bacteriology, Thesis, and Electives.

HUMAN MORTALITY IN BRITISH GUIANA.

In our editorial on aspects of labour-supply in the last issue of this Journal, we attributed the inadequate labour supply of certain tropical colonies to circumstances other than the health factor alone. There is no doubt, however, that according to recent statistics, the health factor is one of the principal circumstances which causes shortage of labour in British Guiana. Recently the Demerara *Daily Argosy* published an article, based on statistics issued by the colony's Registrar General, which show the truly deplorable position in regard to the birth-rate and death-rate amongst the labouring sections of that community.

At the end of last year the estimated population was 310,972. In the last five years there has been an increase in the total population of 6,823, being at the rate of 4 per thousand per annum. It may be noted that during the same period, the increase in Trinidad was 14 per thousand, in Barbados 21 per thousand, and in Jamaica 6·6 per thousand.

The birth-rate was 25·1 per thousand as compared with 28·4 for 1917. The average birth-rate for the previous five years was 31·0 per thousand.

Of the total number of births registered, 3,401 or 43·7 per cent. were legitimate, and 4,390 or 56·3 per cent illegitimate The rate of illegitimate births, though high in British Guiana, is however less than in Trinidad (70·5 per cent.), Jamaica (67·7 per cent.), St. Vincent (65·9 per cent.), Barbados (65·6 per cent.), and St. Lucia (58·8 per cent.). This unsatisfactory state of affairs has a very great significance, for illegitimacy is closely associated with infantile mortality, which in itself is one of the principal causes of the high death-rates.

Continuing, the *Argosy* says :—

'The death-rate was 40·6 per 1,000 as against 30·4 per 1,000 for 1917. The mean rate for the previous five years was 26·8 per 1,000. The death-rate for males was 44·7 per 1,000, and for females 30·1 per 1,000. These figures are ominous. Although aggravated to some extent by the influenza epidemic, which in December alone caused 2,326 deaths, they still prove that there is no natural increase in the population of the colony. For the past ten years indeed the death-rate has been higher than the birth-rate, a state of affairs which exists neither in Trinidad, Barbados, nor Jamaica. Dr. Wise, the then Surgeon General, reported in 1916 that the period 1912-16 "constituted a record for health in the colony, being unequalled by any other five-year period in the last fifty years." In spite of this fact the balance is against us. The figures for 1918 are, to quote Mr. Clementi, "deplorably bad." The birth-rate is the lowest on record since 1894, and the mortality higher than in any year since 1868. When we consider that the epidemic of influenza made its heaviest toll in January of this year—there were 4,698 of which 3,860 were ascribed to that disease—it is unlikely that the vital statistics for 1919 will show much improvement. Up to the end of March, the death-rate for the quarter reached the appalling figure of 85·1 per 1,000, while the birth-rate was only 26·3 per 1,000. On March 31, 1919, there were 3,614 people less in the colony than at the end of 1914. Infantile mortality still reaches a very high figure, and is substantially increasing on previous years, except amongst Europeans. It is obvious that while these conditions prevail, one cannot look with any degree of optimism to the future. The population may be artificially increased by wholesale immigration, but there is little possibility of colonization in the true sense of the word, while there is an annually recurrent natural decrease of population. The high death-rate is largely due to diseases of a preventable character, and to infantile mortality consequent on the low standard of life of the parents. Until practical steps are taken to reduce the spread of disease, and to ensure completely sanitary conditions of living, there can be little hope of improvement. This problem makes the most insistent demand on the administration, and only with its solution will come the fundamental basis on which the colony's progress may rest.

BANANA CIDER.

In his quaint book "'A True and Exact History of the Island of Barbados,' published in 1653, the author, Richard Ligon, speaks of a drink made from plantains. His account of this drink and its method of preparation, however, lacks exactness. It is as follows: 'Gathering plantines full ripe, and in the height of their sweetnesse, we pill off the skin, and mash them in water well boyl'd, and after we have let them stay there a night, we strain it, and bottle it up, and in a week drink it; and it is very strong and pleasant drinke, but it is to be drunk sparingly, for it is much stronger than Sack, and is apt to mount up into the head.'

An article appearing in the *Bulletin Agricole*, of Saigon in French Indo-China, for July 1919, is of interest with regard to this subject. The author, General Leblois, Commanding Officer of the French troops in Indo-China, draws attention to the possibility of the manufacture of wholesome and pleasant cider from ripe bananas. He points out that the fruit is common in that tropical province, and he declares that the drink made from bananas, according to the recipe which he furnishes, is both pleasant and wholesome. This drink is already being manufactured by the Co-operative Military Store at Hué, and the soldiers at that station scarcely drink anything else.

The General's recipe is as follows :—

Material required to make 25 litres (about 5½ gallons) of cider.

125 grammes (little less than 5 oz.) of tea. (*Fleurs de thé.*)

1·8 kilo (about 4 lb.) of crystallized sugar.

25 grammes (little less than an ounce) of tartaric acid.

6 bananas thoroughly ripe.

4 small tablets of native yeast

Bring to the boil 5 litres (about 1¼ gallons) of water, add the tea, and allow it to boil for a quarter of an hour, covering the vessel while the water is boiling.

Pour off the water without the tea leaves into a demi-john half full of cold water, add the sugar, the tartaric acid, the bananas cut into small pieces, and the yeast crushed.

Stir the liquid for a quarter of an hour with a stick, then fill the demi-john.

Leave the mixture to ferment about six or eight days, taking care to stir it every day for a few minutes. Bottle it, and wire the bottles.

Let the bottles remain on their sides for some days, but if the corks appear to be starting, place the bottles upright.

At the end of the seventh day the cider can be drunk, and even on the fifth or sixth day, according to whether one prefers it more or less sweet, or with more or less alcohol.

Another recipe for preparing about 30 gallons of banana cider in a cask is also given, but the proportions of the ingredients are much the same as above A caution is appended to this, as to the necessity of using strong bottles, sound corks, and stout wire.

The editor of the bulletin says, in a note appended to the article noticed above, that this banana cider might without doubt advantageously replace drinks strongly fortified with alcohol, which are too often sold under the name of wines in the East.

THE ELECTRICAL TREATMENT OF SEEDS.

The following is an abstract published in the *Journal of the Royal Society of Arts*, of a paper read before the British Association for the Advancement of Science, 1919:—

This process is the result of experiments that have been in progress for the last seven or eight years; but it has been tried on a commercial scale for only the last three seasons, and may therefore be called quite new.

Three seasons ago it was tried by about a dozen farmers; two seasons ago by more than 150, and this season by more than 500. This rapid progress has been due almost entirely to the recommendation made by one farmer to another, or by seedsmen to farmers The process has not been advertised.

Properly conducted, the electrification of seed never fails to produce an increase in a crop of corn. In every one of the few cases in which this result has not been produced, it has been found that some mistake has been made in the process.

The increase in yield varies from 4 bushels to 20 or more bushels per acre; the average of a considerable number of trials is about 10 bushels, or about 30 per cent.

Every kind of seed requires its own peculiar treatment, and this treatment has been completely ascertained only for cereal crops. Large quantities of electrified root seeds have, however, been sown this season.

The cost of electrification is small; the process is simple, and adds nothing to the labour of the farmer, to the implements for operation on the farm, or to his capital outlay, unless he chooses to electrify the seed for himself. Numerous pairs of specimens grown from electrified and unelectrified seed of the same kind in the same field were shown.

Agricultural Inspection in Grenada.—Reports of the Agricultural Inspectors in Grenada for the months of July, August and September show that their visits to all parts of the colony for instructional purposes must be productive of benefit to its agriculture. Especially is this the case with regard to the annual Prize Holdings Competitions; competitors are advised, and their plots inspected in such a way as to give them an insight into the principles which underlie successful cultivation.

With regard to the coming cacao crop, the reports consider that it will be a large one. The attacks of thrips do not appear to be troublesome, due probably to the measures being generally taken to combat this pest, not only by spraying the trees with insecticides, but by improved drainage and cultivation of the orchards.

A good crop of corn is hoped for in St. George's parish, but the prospects of the same crop in Carriacou are stated to be very disappointing, owing to want of care in seed selection, and inefficient methods of cultivation. In this connexion the report points out that for lime trees to succeed, it is necessary to give them attention, especially in their young stage.

The cultivation of onions by small holders is being extended, which is to be commended, as likely to prove profitable.

The importation of a thorough bred horse into Carriacou, for the purpose of improving the local breed of ponies is noticed.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of September:—

In considering the position of drugs and spices in the London wholesale markets during the month of September, we can only repeat what we have said for several months past, that there has been a general inactivity of interest among buyers, while owners have for the most part demanded increased rates for most of the products that come under our notice. The following are some of the principal:—

GINGER.

At the auction on the 18th of the month ginger was in fair supply, being represented by 504 bags, only 24 of which were sold, 70*s.* per cwt. being paid for fair small to bold washed wormy Cochin.

NUTMEGS, MACE, AND PIMENTO.

In the early part of the month nutmegs were reported as steady of sale, West Indian being quoted at 1*s.* 1*d.* per lb. for 110's. At auction on the 18th, 374 packages of West Indian were brought forward, and met with a good demand at from 1*d.* to 2*d* per lb. on the previous rates. Mace was offered in good supply at auction on the 4th of the month, being represented by 244 cases of Java, of which 164 were sold at from 10*d.* to 1*s.* per lb.; 8 packages of fair West Indian were also disposed of at 10*d.* to 1*s.* per lb. Again on the 18th of the month mace was in good supply, when 75 packages of West Indian were disposed of at the following rates: good pale, slightly broken, 1*s.* 7*d.* to 1*s.* 8*d.*; dark broken 11*d.* to 1*s.*; 89 cases of Java were also disposed of at 1*s.* 5*d.* to 1*s.* 7*d.* for palish and slightly broken. At auction on the 4th of the month some 750 bags of pimento were brought forward as a prize cargo, and sold at from 5*d.* to 5½*d.* per lb, a price it maintained for the rest of the month.

SARSAPARILLA.

Sarsaparilla was in fair supply at the the auction on the 25th of the month, as follows: grey Jamaica 25 bales, Lima 51 bales, and native Jamaica 18 bales. No sales of either kind were effected, as all the kinds was reported to be of inferior quality. For the grey Jamaica, which was part wormy, 1*s.* 9*d.* to 2*s.* was asked, and for the Lima-Jamaica, 2*s.* to 2*s.* 6*d.* It was stated at the auction that native Jamaica was very scarce.

ARROWROOT, KOLA, ANNATTO SEED, CASHEW NUTS, CASSIA FISTULA, LIME OIL, LIME JUICE, TAMARINDS, AND CITRIC ACID.

At the first auction in the month the large consignment of 387 barrels of St. Vincent arrowroot were offered and bought in, middling manufacturing at 6*d.* per lb., common at 5*d.* to 5½*d.*, and inferior at 3*d.* At the same auction, 5 bags of West Indian kola were offered, and sold at 6½*d.* per lb. At auction on the 25th, 50 bales of annatto seeds were withdrawn at 6½*d.* per lb.; 75 packages of cashew nuts were offered at this sale but none sold. On the other hand, 15 bags of Cassia Fistula brought forward, were all sold at an advance, it was stated, on previous rates of 10*s.*; 15 bags of fair, sound St. Lucia fetched 180*s.* West Indian lime oil has been easy throughout the month, distilled being offered at 3*s.* 9*d.* per lb, and hand-pressed at 11*s.* At auction on the 4th of the month 151 barrels of Barbados tamarinds were offered, and bought in at 40*s.* per cwt. Citric acid was quoted at the end of the month at from 4*s.* 3*d.* to 4*s.* 4*d.* per lb.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, October 16.

BALATA—Venezuelan Block, no quotations ; West Indian Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 125*s.* to 126*s.*; Grenada, 118*s.* to 126*s.*; Jamaica, St. Lucia, St. Vincent, and Dominica, no quotations.
COPRA—£55.
HONEY—Jamaica, 72*s.* 6*d.* to 90*s.*
LIME JUICE—Raw, 2*s.* 3*d.* and 2*s.* 6*d* ; Concentrated, no quotations.
PIMENTO—5½*d.*
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

Barbados—Messrs. T. S. GARRAWAY & Co., September 16.

ARROWROOT—$8·00 per 100 lb.
CACAO—$22·00 to $24·00 per 100 lb.
COCO-NUTS—$60·00 husked nuts.
HAY—$4·50 to $4·75 per 100 lb.
ONIONS—$12·00.
PEAS, SPLIT—No quotations; Canada, $8·50 to $10·00.
POTATOES—No quotations
SUGAR—Embargoed.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD, September 21, 1919.

BAY OIL—16*s.* to 17*s.*
LIME OIL—Flat, at 3*s.* 9*d.* to 4*s.* for West Indian distilled, and 11*s.* for hand-pressed.
ORANGE OIL—West Indian sweet, 8*s.* 6*d.* to 9*s.* 6*d.*; bitter, 9*s.* to 10*s.*

Trinidad.—Messrs. GORDON, GRANT & Co., November 5.

CACAO—Venezuelan, $26·00 ; Trinidad, $25·00 to $26·00.
COCO-NUT OIL—$1·65 per gallon.
COFFEE—Venezuelan, 26c. per lb..
COPRA—8c. to 8½c. per lb.
DHAL—$10·25.
ONIONS—$10·00 per 100 lb.
PEAS, SPLIT—$9·00 per bag.
POTATOES—English, $4·00 to $4·50 per 100 lb.
RICE—Yellow, $12·00; to $13·00 White, $12·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., October 3.

CACAO—Caracas, 28c. ; Grenada, 24½c. to 24¾c. ; Trinidad, 24½c. to 25c.; Jamaica, 20½c.
COCO-NUTS—Jamaica selects, $88·00; Trinidad $88·00; culls, Jamaica, $60·00 ; Trinidad $60·00 per M.
COFFEE—Jamaica, 20½c. to 24c. per lb.
GINGER—21c. to 24c. per lb.
GOAT SKINS—Jamaica $1·60; Antigua and Barbados, $1·60; St. Thomas and St. Kitts, $1·50.
GRAPE FRUIT—Jamaica, $5·00 to $5·50.
LIMES—No market.
MACE—40c. per lb.
NUTMEGS—19c. to 19½c.
ORANGES—$2·50 to $3·00.
PIMENTO—9¼c. per lb.
SUGAR—Centrifugals, 96°, 8c.; Muscovados, 89°, 7c. Molasses, 89°, 6½c. all duty paid.

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October 9, 1919.

AGENTS FOR PUBLICATIONS OF THE IMPERIAL DEPARTMENT.

London: Messrs. DULAU & Co., Ltd., 34-36, Margaret Street, Cavendish Square, W.
WEST INDIA COMMITTEE, 15, Seething Lane.
Barbados : ADVOCATE Co., LTD., Broad Street, Bridgetown.
Jamaica : THE EDUCATIONAL SUPPLY COMPANY, 16, King Street, Kingston.
British Guiana : THE ARGOSY Co., LTD., Georgetown.
Trinidad: Messrs. MUIR-MARSHALL & Co., Port-of-Spain.
Tobago: Mr. C. L. PLAGEMANN, Scarborough.
Bahamas: Mr. H. G. CHRISTIE, Board of Agriculture, Nassau.
Grenada: Messrs. THOS. LAWLOR & Co., St. George
St. Vincent: Mr. J. D. BONADIE, 'Times' Office.
St. Lucia: Mr. R. W. NILES, Botanic Station.
Dominica: Mr. J. R. H. BRIDGEWATER, Roseau.
Montserrat: Mr. W. ROBSON, Botanic Station.
Antigua: Mr. S. D. MALONE, St. John's.
St. Kitts: THE BIBLE AND BOOK SUPPLY AGENCY, BASSETERRE.
Nevis: Mr. W. I HOWELL, Experiment Station.
Canada: LEWIS W. CLEMENS, 801, Yonge Street, Toronto.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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CONTENTS.

	PAGE
About Cotton	377
Agriculture in Barbados	383
Antiseptics, Injection of, into Diseased Trees ...	373
British Molasses Company, The	377
Cacao at Havre	383
Cattle Grazing in British Guiana	379
Cotton Notes :–	
A Sea Island Cotton Project	374
Cotton Exports from the West Indies ...	374
Sea Island Cotton Market	374
Department News ...	379
Departmental Reports ...	372
Empire Botany	369
Flour Factory in British Guiana	371
Gleanings	380
Hevea Brasiliensis, Variation in	381
Imperial Department Publications	376
Impressions of an American Sugar Chemist in the French West Indies	370
Insect Notes :—	
The Toad in the West Indies	378
Items of Local Interest	382
Manures, Chemical, West Indian Imports of ...	377
Market Reports	384
Notes and Comments ...	376
Onion Growing in Grenada	374
Onion Seed, Storage of, in the Tropics	375
Pine-apple Cloth as Made in China	377
Rubber Seed Oil ...	376
Rubber Trees, Selection of	379
Sugar and Tobacco Prospects in Nigeria ...	371
Tomatoes, Increasing the Yields of	381

Empire Botany.

IN his recent presidential Address*, Sir Daniel Morris, K.C.M.G., formerly Imperia Commissioner of Agriculture for the West Indies, gave a comprehensive survey of botanical progress and tendencies at Home, in India, the Dominions, and in the Colonies. Much of what he said has a direct bearing on tropical agriculture ; all of what he said shows how closely botanical research is connected with the increased production of vegetable products, whether for food or manufacture, throughout the world.

Referring first to the scientific exploration of the resources of the Empire, Sir Daniel pointed out that it was satisfactory to note that the publications dealing with the floras of tropical and sub-tropical countries have been continued. These publications, apart from their purely scientific value, reveal the existence and distribution of plants that may eventually prove of economic importance. A notable work, 'Flora Capensis', is nearly completed by the Union Government of South Africa, under the auspices of Kew, and another important contribution to systematic botany is the 'Flora of Tropical Africa,' of which six volumes have already been published. In connexion with these matters, Sir Daniel Morris called attention to the need of complete floras of the West Indian colonies, especially of the larger ones like Trinidad and British Guiana. At present Jamaica is the only colony in the West Indies that has been accurately surveyed botanically.

Passing on to what has and is being done to develop the resources of the tropics, Sir Daniel referred to the work of the Imperial Department of Agriculture for the West Indies. A gratifying proof of the value of its work has been the formation in India and elsewhere of Departments on similar lines. An interesting feature of this agricultural and scientific work has been the steady increase in the number of scientific and technical officers attached to Government botanical establishments in various parts

* To the Botanical Section of the British Association for the Advancement of Science, Bournemouth Meeting, 1919.

of the Empire. The number has increased from 122 in 1892 to 332 in 1918.

A considerable amount of attention was given in the Address to botanical work on the sugar-cane. Reference was made to the seedling selection work of Harrison and Bovell in the West Indies, and to Barber's work in India. Harrison's experience suggests a special line of research, viz., to ascertain the cause in the increase in vegetative vigour and yield that follows a first cross in the sugar-cane, only to disappear in later stages.

Concerning cotton, Sir Daniel again makes reference to West Indian research, instancing the recent work of Harland in St. Vincent. This investigator has shown that by following certain lines of selection, it is possible to isolate a pure strain of Sea Island cotton with a weight of lint per boll 31 per cent. greater than that of the ordinary sorts in cultivation. In connexion with West Indian cotton, attention is also drawn to the successful work on Internal Boll disease. The investigation of this disease, has, in the words of Sir Daniel, 'entailed wide research, and illustrates the great complexity of problems in tropical plant pathology, as also the need of correlation, and the combination of knowledge obtained by simultaneous action from several points of view.'

A very large amount of cotton research has been carried out in Egypt, chiefly by Balls, and in India, notably by Leak. This work has been of a highly technical character, and has had far-reaching results.

In regard to rubber, Sir Daniel referred to the great value of breeding experiments with Hevea. A start has only just been made, and progress will be slow compared with that attained in the case of annual crops; but the work has been started. For instance, at the Heneratgoda Gardens in Ceylon, there are fifty Hevea trees whose individual latex-yield has been recorded for every tapping since June 1908. One tree marked No. 2 has yielded an amount of rubber far in excess of any other tree. In 1912 seeds and stumps taken from this tree were established. When the trees are fit for tapping and the good yielders are determined, the poor yielders will be cut out and the remainder reserved for seed purposes.

It is not possible within the compass of this article to make reference to all the matters dealt with in Sir Daniel Morris's Address, but our review would be incomplete without some reference to the excellent botanical work done within the Empire in connexion with wheat. The researches of Biffen at Cambridge, of the Howards in India, and of Backhouse (formerly of the John Innes Institution) in the Argentine, have been of the most valuable character. Biffen, for instance, bred a wheat which yielded an average of eighty-six bushels per acre compared with thirty-two bushels, the average yield of wheat in the British Isles. While the layman may not appreciate the scientific side of this work, he will scarcely fail to be impressed by the importance of the economic results.

It is one thing to breed plants, and another thing to grow them on a commercial scale. A serious factor to be contended with is disease and the attacks of insect pests. Breeding experiments help in overcoming this difficulty through the isolation of resistant strains, as in the case of Biffen's rust-resistant wheats; but to a great extent we have to rely upon the plant pathologist in these matters. An instance of the sort of work accomplished in this connexion has already been given; other notable instances are afforded by Nowell's work on root diseases and on the red ring of coco-nuts; by Rorer's on cacao canker; by Butler's work in India on the diseases of the sugar-cane; and by Sharple's work in the Federated Malay States on maladies of the Hevea rubber tree.

As Sir Daniel Morris points out, these and previous references show in what vast fields of enterprise botanical science has rendered signal service to the Empire. As regards the future, he says: 'if we enlist the best intellects imbued with the true spirit of progressive research, we shall ensure a continuance of discoveries that have proved so effectual. We must also call to our assistance some of that wonderful energy developed during the war and divert it to the great work before us.'

SUGAR INDUSTRY.

IMPRESSIONS OF A SUGAR CHEMIST IN THE FRENCH WEST INDIES.

In February of this year, Dr. C. A. Browne, Chemist of the New York Sugar Trade Laboratory, paid a visit to Guadeloupe and Martinique with the object of visiting the various sugar factories and plantations in those islands. An account of these visits appears in *Facts About Sugar* for September 13, 1919. Dr. Browne's impressions in regard to the sugar industry of British Guiana and Barbados were reviewed in the last issue of the *Agricultural News*.

In Guadeloupe and Martinique the sugar industry appears to suffer under certain disabilities which are more

or less absent to a far greater extent in other places. In pointing out the primitive character of the factory equipment in these French islands, Dr. Browne recognizes the effect that has been produced in the past by the great natural catastrophes like volcanic eruptions and hurricanes which have from time to time afflicted the islands.

In regard to the plantations themselves, a very serious amount of damage is occasioned by root disease and by moth and root borers. These losses, though directly due to pests and diseases, are indirectly the result of poor agricultural practice. With a view to improving matters, Mr. Dash, the Director of the Experiment Station, has advised the planters of Guadeloupe to discontinue the cultivation of third ratoons, and before replanting with cane, to turn their fields for a year into forage and other rotation crops.

The sugar produced by the primitive methods of these French islands is naturally of poor quality. This, however, has not caused much concern, for the principal product of the islands during the past year or two has been rum. This spirit has recently been selling in France at 9 francs a litre. So high a price caused such activity among the colonial distilleries that some of them were paying as much as 6 francs a gallon for molasses.

Dr. Browne concludes his interesting article by referring to the enterprise that is being shown by one or two proprietors who are being provided with machinery of the latest French type. If this enterprise, which at present is exceptional, becomes more general, Dr. Browne believes that there is every prospect of as much prosperity in these French islands as in the neighbouring ones belonging to the United States and Great Britain.

Sugar and Tobacco Prospects in Nigeria.—The West Indian sugar-cane, which was introduced in 1914 into the Northern Provinces of Nigeria, is now cultivated over a wide area, but it is necessary to modify the opinion which was formed at first, as to the probability of its entirely ousting the indigenous cane of the country. The cane of Nigeria is primarily grown for chewing, and the tough woody cortex of the West Indian cane renders it less acceptable for this purpose. Two small privately owned sugar mills are at present working in Zaria province, but the native is slow to purchase the sugar for his own use at the current price, and the demand from the European residents is small.

Experiments in growing Virginian tobacco, which were started at Ilorin in 1915, have progressed. For leaf of the 1917 crop, grown under the supervision of the Agricultural Department, the natives received 10*d.* and 8*d.* per lb., respectively, for first and second quality. A great development of tobacco growing in Ilorin province is predicted in the near future. The crop brings a relatively high price, and for that reason will bear the cost of transport over long distances.

Sisal does well at Ilorin, but the cultivation of this plant for fibre involves the establishment of large plantations and central factories. For this, European enterprise will be needed, but is not yet in sight.

The trade in decorticated ground nuts, which centres around Kano, continues to develop, and the output last season was estimated at 80,000 tons. The prices of cattle, hides, and skins have all risen in recent years, and have helped to increase the wealth and prosperity of the country, which will be a growing market for British manufactured goods in the future.

FLOUR FACTORY IN BRITISH GUIANA.

A new factory was recently opened in Demerara by the Governor, on which occasion Professor Harrison, the Director of Science and Agriculture, made a few remarks as to the origin of the scheme. A full report was published in the *Port-of-Spain Gazette* for November 5, 1919.

Professor Harrison said that during the war there had been a threatened scarcity of foodstuffs, and the position becoming gradually worse towards the end of 1916, at the annual session of the Combined Court in November 1916, on the motion of the Hon. P. N. Browne, K.C, the Officer Administering the Government was asked to appoint a Committee to enquire into and report upon the feasibility of local manufacture from the vegetable products of the colony of substitutes for or adjuncts to wheat-flour and other imported cereal foodstuffs in commercial quantities for consumption in the colony and for export, special attention being directed towards the possibility of largely increasing the local output of the raw materials, and of the financial aspects of the manufacture and marketing of the resultant products.

The Committee, after very full and careful consideration, reported favourably on the prosposal to erect and equip a factory for the preparation of flour from local foodstuffs. The Committee considered that a sum of approximately $15,000 would suffice for the equipment of a flour substitutes factory, and recommended that their proposal be considered by a committee to consist largely of business men. For this purpose the Governor appointed the Flour Factory Advisory Committee. The Committee reported under date of June 18, 1917, that it was unanimously in favour of money being provided for the erection in Georgetown of a building and suitable machinery for the purpose of converting rice, maize, guinea corn and similar products into flour for use in the preparation of bread, cakes, etc. The Committee was unable to furnish any estimate of cost, and the suggestion of the Flour Substitutes Committee that a subsidy of $15,000 should be placed at the disposal of a small board of management was put before the Combined Court and adopted.

The Board at once started inquiries in the United States of America, but few results had accrued from these inquiries. The item of $15,000 was revoted on the 1918 Estimates.

Early in 1918, the Board got in touch with the Kalvin Engineering Company of New York, who quoted $12,200 as the price in New York of machinery necessary for drying, milling and bolting rice and maize to flour. The Board, after careful consideration, arrived at the conclusion that the erection of a rice and maize flour factory was a matter of some urgency, and advised the Government that the tender should be at once accepted. This was done by cable on March 12, 1918, but no part of the machinery reached Georgetown until October 1, 1918. The Combined Court on November 29, 1918, decided that a sum of $16,500 should be granted in addition to the original grant of $15,000, so that the factory should be constructed and equipped. The cost of the erection of the factory in round figures to date has been $28,790 or say $2,700 less than the original estimate.

The factory is designed to dry 100 bags of rough rice or corn, and to mill 60 bags of 180 lb. of rice or corn flour per day of nine hours.

Professor Harrison then asked His Excellency to declare the factory open."

SUGAR-CANE EXPERIMENTS IN THE LEEWARD ISLANDS, 1916-17 AND 1917-18.

Owing to changes in the staff of the Agricultural Department of the colony, and for other reasons due to war conditions, it has been necessary to combine the reports for the two seasons, and issue them together. In previous reports there has been a section dealing with manurial experiments. On account of the difficulty, and even impossibility of obtaining chemical manures during the years under review, this side of experimentation is not dealt with; the report is confined to the experiments on varieties of sugar-cane plants and ratoons, these being conducted in the three islands, Antigua, St. Kitts, and Nevis. Reference to the manurial experiments in connexion with pen manure, which were continued, will be made in next year's report

The variety experiments are carried out on fields on various estates situated in the principal sugar-producing areas of the colony In this way the effort has been made to give due expression to the effect of variations in the climatic conditions and prevailing soil types which occur at the different points.

The number of seedling canes now available for choice to cane planters is enormously large, and without some system of preliminary selection, it becomes a matter of difficulty for the planter to make an intelligent selection. By this system of experiment stations scattered throughout the cane-producing area, it becomes easy to test the newly introduced and most promising varieties and to discard those which are unsuited to local conditions.

As in previous reports there is a description in tabular form of the varieties of cane, some sixty in number, which are being experimented on in the three islands. Then tables are given of the actual return in weight of cane, gallons of juice, and sucrose content of each variety.

In each of the three islands the rainfall for the season 1916-17 was above the average, whereas that of 1917-18 was very much below it.

In Antigua in the former season, as regards plant canes, the first place on the table is occupied by B. 6308, which gave an average return of 26·3 tons of cane per acre, and 5,240 lb. of sucrose; the sucrose content of the juice being 2·23 lb. per gallon. Introduced in 1913, the present is the fourth year in which this cane has been experimentally cultivated in Antigua, and the third in succession in which it has headed the list. It has also topped the list in both St. Kitts and Nevis in the present season, yielding 33 tons per acre in the former place, and 51 tons in the latter. Its average for four seasons on twenty-nine plots is third place, with 4,720 lb. sucrose per acre.

Sealy Seedling occupies the second place with a yield of 29·1 tons cane per acre, and 4,700 lb. sucrose per acre, the average return of the juice being 2·08 lb. sucrose per gallon. This cane has been under experiment for eighteen years, and may be regarded as one of the standard varieties of cane under cultivation in Antigua. It is evidently a very dependable variety, its average for ten seasons on sixty-nine plots being 5,030 lb. sucrose per acre, and its position being second.

The third cane on the list is B. 4596, which has given an average return of 26·2 tons of canes per acre and 4,680 lb of sucrose per acre. This cane has been under experimental cultivation for nine years, and has proved to be a good standard cane, giving uniformly satisfactory results.

The Antigua varieties do not appear to have done particularly well this season, A. 95 occupying the twenty-ninth place, and A. 2 the thirty-seventh. The latter cane, however, has done well on heavy lands.

For the dry season of 1917-18 the following results are given: The first place for this season is occupied by B.3922, which gave an average return of 23·75 tons of canes and 4,370 lb. sucrose per acre, the juice containing 2·25 lb. saccharine matter per gallon.

B. 6308 occupies the second place with a yield of 23·3 tons and 3,910 lb. sucrose per acre, and a sucrose content of 2·09 lb. per gallon. From its constant high position since introduced in 1913—in no case ranking under fifth in position—it is being widely adopted by planters.

The third place is occupied by Sealy Seedling with an average of 22·8 tons of cane and 3,280 lb. sucrose per acre. This cane has now been under experiment for nineteen years, and is one of the standard varieties under general cultivation in Antigua; it is apparently a very dependable type. Of the present crop, 1,334 acres, or approximately 15 per cent. of the total acreage under cane is planted in this variety.

With regard to ratoons in 1916-17, it is interesting to note that the South African variety, Uba, comes first as to results. This cane was tried for the first time this season as a ratoon, and gave a yield of 22·0 tons of cane per acre and 3,170 lb. sucrose.

Owing to scanty rainfall—36·8 inches as compared with 56·7 and 61·3 in the previous years—the yields for 1917-18 are exceptionally low. In some cases only 4·1 tons of cane per acre were obtained, while as low yields as 2·5 tons per acre were recorded for White Transparent.

Turning now to St. Kitts, it appears that, as to plant canes in the season 1916-17, the first place is occupied by B. 6308, which gave a mean return of 33·2 tons per acre, and 7,820 lb. sucrose per acre, the juice possessing a saccharine richness of 1·96 lb. per gallon.

The second place is occupied by B. 6388, another new cane in the selected varieties. This gave a mean return of 30·8 tons cane and 7,670 lb. per acre, with a saccharine content of 2·05 lb. per gallon.

The third place is occupied by B. 4596 for sucrose, giving 7,500 lb. per acre, but it holds the first place for tonnage with 37·1 tons cane per acre. This is a well-known variety which germinates easily, but its saccharine content is low, only averaging 1·64 lb. per gallon. In the opinion of some planters this variety shows signs of deterioration, especially with regard to root disease, and requires to be watched.

A. 2 is disappointing as a plant this season, coming out thirteenth on the list among the varieties. As an estate cane it is a great favourite in the northern districts, and is largely planted.

As in Antigua so also in St. Kitts, the rainfall for the season 1917-18 was much below the average. The following results with plant canes are given as to the best three: The first place on the list is occupied by Ba.6032, which gave a mean return of 33·4 tons cane per acre, the juice possessing a saccharine richness of 1·92 lb. per gallon.

This is the first time this cane has been under cultivation in St. Kitts, and it appears to be well suited to the local conditions.

The second place is taken by B.6308 which has given a mean tonnage of 32·3 tons cane per acre, and sucrose of 7,030 lb. per acre. This cane came first on the list for the season of 1916-17, and is also first in the table of means for all seasons.

B.H.10(12) takes the third place on the list, with a mean tonnage of 27·8 tons cane per acre, sucrose 6,980 lb. per acre, and a saccharine content of 2·25 lb. per gallon. This cane is remarkable for its high saccharine content.

With regard to the experiments on ratoons in St. Kitts, it is noted that in 1916-17 the first place is occupied by A. 2, which has given an average return of 27·4 tons cane and 5,850 lb. sucrose per acre. This variety has again done much better as a ratoon than as a plant cane.

In 1917-18, however, the first place in the ratoons is taken by B. 1528, with a tonnage of 21·8 tons cane per acre and sucrose content of 4,120 lb. per acre, while A.2 drops to the fifth place.

In Nevis no experiments were conducted with ratoons. In the season 1916-17, the results of those with plant canes show that the first place is taken, as in St. Kitts and in Antigua, by B. 6308, with the large return of 51 tons of cane and 10,480 lb. of sucrose per acre, and a saccharine content of 1·92 lb. per gallon.

In 1917-18, the leading place is taken in point of tonnage by B.4592, with the low return of 20·1 tons per acre and sucrose content of 1·99.

The report is of great interest, as it clearly shows the necessity of investigation as to the suitability of any particular variety of cane to local environment.

INJECTION OF ANTISEPTICS INTO DISEASED TREES.

In a paper constituting Part III of an account of silver-leaf disease in Great Britain (The *Journal of Agricultural Science*, Vol. IX, Part 3), F. F. Brooks and M. A. Bailey describe experiments to treat the diseased trees by the injection of antiseptics, which may find application in the case of some stem and root diseases in the West Indies. Sulphate of iron was applied both as a dressing to the roots and by plugging it into the stems. The treatment was not found to be successful. In view of Ehrlich's work on therapy, the effect of an injection of neo-salvarson (606) was tried upon two silvered plum trees. Holes were bored into these trees towards the base of the stem, and ·06 gram of this substance dissolved in 5c.c. of distilled water was poured into each, the holes being afterward sealed with plasticine. Two injections were made in one tree and one in the other. The tree injected once did not recover, but in the one which was given two doses, the upper leaves wilted soon after the unfolding of the buds, and the top of the tree died; this was probably due to the neo-salvarson being too concentrated. The lower branches of the tree recovered, on the other hand, and other healthy shoots subsequently arose. It is likely that the fungus in this tree was killed by the injection of neo-salvarson, but a considerable part, though not all of the tree, was also killed in the process

'Preliminary experiments on the injection of dilute solutions of certain aniline dyes into the branches of a large plum tree having shown a possibility of success by treatment with these substances, further trials of a more careful nature were made. For this purpose, the main roots of the trees to be experimented with were exposed at about the time of the opening of the buds; one, two or three of the roots were then severed, and at once connected by means of tubing with reservoirs containing a dilute solution of the dye, placed at a higher level. The exposed portions of roots were enclosed with slates which were readily removable if the roots required attention. At first, absorption of the solutions was rapid, and when it slowed down the several ends of the roots were pared, thus allowing absorption again to become vigorous. Dilute solutions of the following dyes were used for this purpose: Congo Red, Gentian Violet, Eosin, Methyl Violet, and Methylene Blue. It was not expected that the last-named would prove toxic to the fungus, as it is often used in dilute solution for *intra-vitam* staining, but, being a very clear stain, one thought it had the best chance of showing, by staining the wood, whether such dyes were carried to the extremities of the trees. The exact strength of these dyes in the transpiration current cannot be given for obvious reasons, but it was considerably less than 1 in 2,000, as the solutions were made up at a strength of 1 in 2,000 or 1 in 10,000. The results were as follows:—

'(1) *Eosin.* Of four treated trees, two recovered, although some of the young leaves withered in one of these. A third tree showed partial recovery, but some of the leaves were killed. The remaining tree showed no improvement.

'(2) *Methyl Violet.* One tree recovered but two others showed no improvement. None of the leaves were killed.

'(3) *Congo Red.* The only tree treated with this became healthy. None of the leaves were killed.

'(4) *Gentian Violet.* As for Congo Red.

'(5) *Methylene Blue.* One tree recovered and one remained silvered. None of the leaves were adversely affected by this dye.

'(6) *Control.* One tree in which distilled water was absorbed in the same way did not recover.

'In the trees which absorbed these dyes, the xylem of the leaf petioles, especially the lower ones, became stained after a time, methylene blue being most evident, although it could not be detected in the uppermost leaves of the tree. The recoveries in these experiments were more nemerous than have ever been observed by us to occur naturally, and it is likely that some at any rate were due to these dyes acting toxically on the fungus without seriously affecting the host. At present, these results are only of scientific interest, and until treatment of this kind has been applied on a larger scale, much importance cannot be assigned to it. From the practical point of view nothing can be done at present along these lines, as the methods here used are too troublesome and too costly. If, however, certain of these dyes could be obtained at a cheap rate, modified methods of injecting trees invaded by fungi in the wood, might be tried with some prospect of success.

'While the above experiments were being carried out with dyes, other toxic substances also were injected in the roots of silvered trees in the same way, but with little or no success. Of two trees injected with a weak solution of ferrous sulphate (made up 1 in 1,000) one doubtfully recovered and the other remained silvered. Solutions of corrosive sublimate and quinine sulphate (made up 1 in 1,000) were without effect. Sodium arsenate, on the other hand, made up at the same strength, had a rapidly toxic effect upon the injected tree, and although the strength of the solution was quickly reduced to 1 in 20,000, all the leaves withered except on one branch low down on the side away from the place of injection. These leaves remained silvered, but by the following year all the upper part of the tree was dead, and only a few sucker shoots, which were healthy, remained.'

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co. on Sea Island cotton in the Southern States, for the week ended October 25, 1919, is as follows:—

ISLANDS. Since our last report of October 4, the market has remained very quiet, the receipts and offering stock being small, with Factors unwilling sellers, until this week, when a demand sprung up taking the offering stock, resulting in sales of upwards of 200 bales, on a basis of Fine to Fully Fine at 70c.

In consequence of the small crop, the planters are inclined to be expectant of high prices, and are not disposed to sell.

We quote, viz :—

Fine to Fully Fine @ 73c., f.o.b. and freight.

GEORGIAS AND FLORIDAS For the past three weeks there has been a good demand taking the limited offerings, the buying being for the Northern Mills. The receipts of new crop cotton have been very small, the stock for sale consisting almost entirely of cotton brought over from previous crops, viz : 1916 to 1917, and 1917 to 1918.

During the past week the demand became more active both in Savannah and throughout the interior markets, resulting in large sales taking such lots as were offered.

We quote the range of prices paid for Average Extra Choice. The supply of Fancy is exceedingly small, and consequently it is impossible to buy except along with other grades.

We quote, viz :—

Average Extra Choice, 66½c. to 70c., f.o.b. and freight.
Fancy, nominal 73c., f.o.b. and freight.

The exports from Savannah since October 4, have been, to Havre 21 bales, Northern Mills 100 bales, Southern Mills 195 bales, and from Jacksonville to Northern Mills 167 bales.

CROP ADVICES. You will find below the United States Census Bureau's report of ginning up to October 18. The estimate of the final outturn continues small, fully confirming our previous advices. The Government will issue its report on October 31, giving condition of crop and estimate of final outturn, which we will await with interest.

The United States Census Bureau reports the amount of cotton ginned to October 18, as follows :—

South Carolina	338 bales	making a total of	1,791 bales.
Georgia	350 bales		
Florida	1,103 bales		
against last year,	9,780 bales.	Total crop	44,380 bales.
,, 1917	43,691 bales.	,, ,,	88,174 bales.
,, 1916	64,931 bales.	,, ,,	113,109 bales.
,, 1915	40,257 bales	,, ,,	85,278 bales.

A Sea Island Cotton Project.—The Mermentau Mineral Land Company, Inc., whose headquarters are at New Orleans, Louisiana, is making good progress in cultivating Sea Island cotton on its 14,000-acre tract of reclaimed land opposite Grand Chenicre on the Mermentau River in that State.

The first acre was planted three years ago, and nearly a thousand pounds of seed-cotton were gathered. This was such a good yield that the plot was extended to 10 acres, with a result as satisfactory. Last year five small farmers in the vicinity were induced to plant from this seed, with the result that they raised 28,000 lb. of excellent cotton with exceptionally long staple. This spring 250 acres were planted and a gin erected, and if the season's results warrant, the entire tract will be devoted to cotton and cattle raising.

COTTON EXPORTS FROM THE WEST INDIES.

The following figures show the quantity and estimated value of Sea Island cotton exported from the West Indies for the quarter ended September 30, 1919 :—

Colony.	Quantity, in lb.	Estimated value, £.
Grenada	nil	nil
St. Vincent	33,549	5,161
Barbados	5,904	228
Montserrat	nil	nil
Antigua	87,500	13,120
St. Kitts	2,545	382
Nevis	nil	nil
Anguilla	,,	,,
Trinidad	,,	,,
Total	129,498 lb.	£18,891

Besides the above, Grenada exported 38,080 lb. Marie Galante cotton, of an estimated value of £1,262, and St. Vincent, 32,552 lb. of Marie Galante cotton, and 3,690 lb. of linters, valued, respectively, at £2,713 and £185.

The figures for the exports from the British Virgin Islands have not yet come to hand, but will be published as soon as received.

ONION GROWING IN GRENADA.

In 1918 it was demonstrated by the Department of Agriculture, Grenada, that onions could be successfully and profitably grown in that colony. The results recorded in the annual report for that period showed an indicated yield per acre of just over 2 tons of marketable produce, although the seed was not sown until late in the season, November 6.

In the current year, work in this direction was continued, and interesting results have been obtained from a trial of this crop in an unusual season.

Seeds were sown in beds in the usual way on February 21. Before sowing the seeds were mixed with ashes that had been damped with kerosene as a precaution against ants, and in the drills they were covered with a mixture of sand and leaf-soil. As the seedlings were being raised in the dry season it was necessary to water the beds several times weekly. By May 6, when showery weather began, a good stand of strong seedlings was available, from which a quantity was transplanted on a plot of well prepared and manured land made up into twelve beds. The land was manured with pen manure, approximately at 20 tons per acre. The crop grew well and was weeded six times from planting to harvesting. Towards the end of July a large proportion of the bulbs showed signs of maturity, but as there were some indications of rotting, due to high moisture and temperature conditions, the tops of the bulbs that were still immature were bent over to hasten ripening. The crop was harvested on August 2.

The area of the plot planted, including paths and drains, was 1,872 square feet. The yield of onions as harvested was 442·68 lb., which is equal to 10,500 lb. or 4·6 tons per acre.

The onions were cured in a well-ventilated room for seventeen days, at the end of which time they were in a marketable condition ; and the loss in weight was equal to 26·51 per cent., giving an indicated yield of marketable onions per acre of 7,969·47 lb. or 3·38 tons.

Calculated on this yield, and the selling prices at 3 cents, 4 cents, and 6 cents, the indicated return per acre would be as follows :-

	£	s.	d.
7,969 lb. at 3 c.	49	6	1½
„ „ „ 4 c.	66	8	2
„ „ „ 6 c.	99	12	3

In our trials the onions sold readily at 12 cents per lb.

On the basis of the cost of growing onions at the Botanic Gardens, the calculated cost per acre—exclusive of the value of the manure used—would be as follows :—

	£	s.	d.
Draining and preparing land	12	15	9
Sowing seeds		6	0
Four pounds seed at 4s.		16	0
Planting out seedlings	5	4	8
Watering	5	19	5
Weeding (six times)	7	7	2
Harvesting		17	5
Stringing	3	12	0
	£36	18	5

From this and the former trial with onions at the Botanic Gardens, it seems probable that two or more crops a year could be raised in Grenada.

It is estimated, on the basis of the above yield, that the produce of about 20 acres would be required to meet the annual local consumption of onions.

It is not to be recommended that anyone should attempt to cultivate a large area of onions without first gaining practical experience; but the cultivation on a small scale by peasant gardeners would be a safe and profitable undertaking, to be strongly recommended and encouraged by the Department of Agriculture.

In the latter direction efforts have recently been made by the Superintendent of Agriculture by lectures, demonstrations, and free distribution of seeds in several districts, where it was thought interest in the matter could most likely be created.

An experiment is now in progress to ascertain whether it is possible to grow our own seed.

THE STORAGE OF ONION SEED IN THE TROPICS.

The following is a brief account of an experiment in the storage of onion seed, conducted by the Grenada Department of Agriculture, the work being done by the Agricultural Cadets under the direction of the Superintendent of Agriculture, Mr. J. C. Moore.

It will be seen that by the use of calcium chloride, successful results were obtained. It may be pointed out that successful results have also been obtained in Antigua (see Annual Report on the Agricultural Department, Antigua, for 1917-18, pp. 7 and 8) by using quicklime; but the percentage of seed that germinated after four months' storage in Antigua over quicklime was not as high as that which grew after being stored for a similar period in Grenada over calcium chloride:—

On February 12, 1919, the Department received a supply of Teneriffe onion seed, but in consequence of its late arrival, there was little demand for it. A quantity of the seed was thus available for carrying out an experiment in a method of storing seeds in a viable condition, which had proved successful when adopted some years ago by the Department of Agriculture in St. Lucia.

Soon after the arrival of the seed four desiccators were prepared for the purpose of the experiment. In the basement of each desiccator was placed 4 oz. of calcium chloride to absorb any free moisture present in the contents of the desiccator. Above the chloride rested a perforated disc, upon which was stored 2·5 lb. of seed, this quantity being the capacity of each desiccator. The ground faces of the rim and cover of the desiccators were then smeared with vaseline in order to form an air-tight joint.

The following is the result of germination tests made time to time to ascertain the vitality of the stored

Desiccator.	Time test commenced.	Days taken to germinate. In seed tester.	In seed bed.	Percentage obtained.
A	July 1	5	5	91
B	August 9	5	7	93
C	Sept. 15	5	5	91
A	„ „	5	5	91
C	„ „	5	5	91
A and C (100 each)	„ „	5	5	91·5
D	November 3	4		93

A test of the seed as received gave a germinating power of 89 per cent., but unfortunately, for the sake of comparison with the results of this experiment, it is not known whether this test represented the vitality of the seeds actually stored, for there were two parcels, and there is some uncertainty as to whether the seeds stored were from the parcel tested.

From September 5 to 22, desiccators A, B, and C were opened several times for purposes other than seed testing; but desiccator D was not opened until November 3, when its contents tested 93 per cent. vitality, whereas a sample of the same imported seed kept in seed bags and tested in July last gave negative results. The contents of desiccator B and part of A and C were disposed of in September.

Examination of the calcium cholride in the desiccators at the end of the experiment showed that the quantity of moisture absorbed from the contents was but small—a film of moisture being evident on the surface of the chloride nearest the seeds, while the bulk of the chloride retained its granular appearance.

From the result of the above experiment it is evident that onion seed can be stored in a sound condition in the tropics for at least nine months, and probably for a longer time, as we hope to show by continuing this experiment with desiccator D.

A test on similar lines made by the St. Lucia Department of Agriculture in 1906-7 (*vide* Annual Report for that year) showed that after storing onion seeds for eight and a half months in the presence of calcium chloride in an air-tight bottle, the germination percentage was 64, while a similar sample of the seeds stored under similar conditions, but without the chloride, failed to germinate at the end of that period.

There seems to be little doubt that—other conditions being favourable—the more effectually onion seeds are protected from the humidity of the atmosphere, the longer they retain their vitality.

There appears in the *American Naturalist*, September-October 1919, Part 2 of the paper on the use of the sucking fish for catching fish and turtles. Part 1 of this paper was abstracted in the *Agricultural News* for September 20, 1919.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in the present number consists of a review of the recent address of Sir Daniel Morris, K.C.M.G., to the Botanical Section of the British Association for the Advancement of Science, 1919.

On page 372 will be found a review of the Report on Sugar-cane Experiments in the Leeward Islands for 1916-17 and 1917-18.

Two interesting articles on onion cultivation in Grenada, and on the storage of onion seed in the tropics, appear at pages 374 and 375.

Insect Notes in this issue deal with the West Indian toad. Reference was made to the same subject in the last issue of this Journal.

Rubber Seed Oil.

It is stated in the *India Rubber World* for October 1, 1919, that 'for most purposes rubber seed oil is a very good substitute for linseed oil.' This statement is not correct, according to the *Agricultural Bulletin of the Federated Malay States*, for March-April 1919. In this it is stated that on examination in England 'the oil was found to be inferior to linseed oil for paint manufacture, but good enough to mix with linseed oil for this purpose.'

In regard to the high cost of shipping rubber seed from the Federated Malay States it is pointed out in the *Agricultural Bulletin* that it would be quite impracticable to do this, unless a special use for rubber seed oil could be definitely found. It is suggested that rubber oil might prove more useful for paint mixing in warm climates than linseed oil, which is said to dry too quickly under hot conditions.

Imperial Department Publications.

The annual reports on the Agricultural Departments of the Windward and Leeward Islands for the year ended March 31, 1918, have now all been issued. In addition to these, the report on Sugar-cane Experiments in the Leeward Islands, and the *West Indian Bulletin*, Vol. XVII, No. 4, have also been issued and are now in course of distribution. The delay in passing these publications through the press is wholly attributable to printing difficulties, but this in no way detracts from their value. There have also been issued recently, the Reports on the Agricultural Departments of Dominica and the British Virgin Islands for 1918-19, and the Reports for St. Lucia, Antigua and St. Vincent are now in the press

From the reviews that have appeared in this Journal of the Departmental Reports, it will be apparent that 1917-18 was a period of no less activity and progress than previous years. In another column of this number is presented a comprehensive summary of the report on sugar-cane experiments in the Leeward Islands.

The number of the *West Indian Bulletin*, which completes Volume XVII, is a very interesting one. The first paper, on the red ring or 'root' disease of coco-nut palms, is a very full description by Mr. W. Nowell, Mycologist of the Imperial Department of Agriculture, of a disease which is responsible for the loss of many coco-nut palms in Trinidad, Tobago, and Grenada. This is well illustrated by plates showing infested material. The second paper is by Dr. N. A. Cobb, of the United States Department of Agriculture, and describes a newly discovered nematode (*Aphelenchus cocophilus*, n. sp.), which causes the above disease, Mr. Novell having discovered the association. Dr. Cobb's paper is illustrated by detailed drawings of the nema. In the third paper, Mr. S. C. Harland, Assistant for Cotton Research on the staff of this Department, gives a second contribution on the improvement of the yield of Sea Island cotton in the West Indies, by the isolation of pure strains. The fourth and last paper

comprises a very comprehensive review by Mr. H. A. Ballou, Entomologist of the Imperial Department of Agriculture, of his report to the Egyptian Government on his investigations into the control of the pink boll worm in Egypt, and the appendix dealing with the development of the cotton industry and the causes which have operated to bring about a steady reduction in the average yield per acre. This is also fully illustrated.

West Indian Imports of Chemical Manures.

In the *Agricultural News* for November 1, 1919, a statement was given as to the quantity and value of chemical manures imported into British Guiana and into Barbados of recent years. These figures showed a great increase in price of these manures since 1914, and a reduction in the quantity imported.

Figures are now to hand in regard to Grenada and St. Lucia.

Imports into Grenada.

1914.		1915.		1916.		1917.		1918.	
Tons.	£ Value.	Tons.	£ Value.	Tons.	£ Value.	Tons.	£ Value.	Tons.	£ Value.
1,025	1,204	604	4,743	322	2,701	92	1,016	15	45

Imports into St. Lucia. (Value only.)

£	£	£	£
5,334	3,617	7,965	639

In regard to these figures, no record has been kept of the amount of different kinds of manure, but it may be mentioned that the principal manures imported into Grenada are Hughes Packard, basic slag, Hubbard's cacao tree manure, and sulphate of ammonia.

The British Molasses Company.

An interesting report on this Company appears in the *Financial News* for October 16, 1919. The company's operations are designed to provide the Liverpool cattle food manufacturers and other users of molasses with this product in large and regular quantities.

'The company is very completely equipped for handling the business right from the plantations of the West Indies to the users at home, and when operating to the full extent of its resources can handle something like 150,000 tons per annum. A fleet of six tank steamers, ranging in capacity from 2,500 tons to 6,000 tons, is regularly employed bringing the molasses in bulk from the islands of the West Indies—Cuba, San Domingo, and Porto Rico. On arrival on this side the molasses is pumped into the company's short tanks situated on the quays at Garston (Liverpool), Birkenhead, Hull, and Glasgow, and finally delivered by the company's motor tank wagons in bulk to the various cattle food manufacturers, or filled into barrels and drums and railed to all parts of the country. The company has tank storage in the United Kingdom for 15,000 tons, and is at present extending operations to meet the growing demand.'

About Cotton.

With its issue of October 25, 1919, *The Times* Trade Supplement commences the publication of an extremely interesting section devoted to cotton. An effort has been made to provide a comprehensive review of the multifarious activities of the trade, from the growing of the fibre to the sale of the printed calico, and they have been fortunate in securing the services of some of the best authorities in the world.

The danger of the present situation from an Imperial standpoint, it is observed, lies in the dependence of the British industry on raw material grown so largely outside the King's dominions; but there is not the slightest doubt that a vastly increased production of cotton could be secured in Egypt and the Sudan by the completion of irrigation schemes which have been put forward, and it is also possible for increased production to be obtained in other parts of the British Dominions, and for new sources of supply to be discovered.

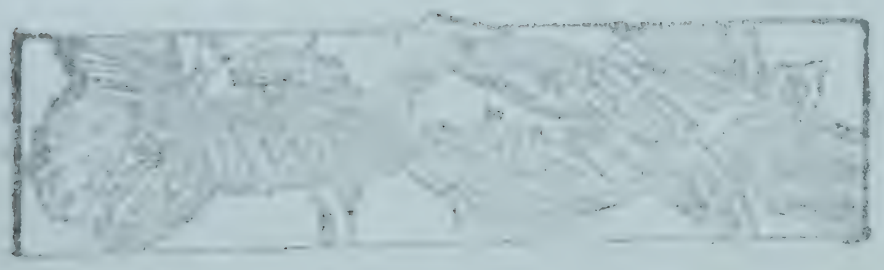
In the West Indies, as is well known, the cotton produced is of fine quality of the Sea Island class. Up to the time of the outbreak of war these islands were producing as much as 6,000 bales. The probability of any considerable increase in production in these colonies would seem to be remote, so long as high prices for sugar prevail. Mr. Hutton, however, has expressed the confident opinion that if the industry is made remunerative to the planters, the West Indies can produce all the Sea Island cotton required by the British industry.

Pine-apple Cloth as made in China.

A brief description of the minor industry of weaving cloth from pine-apple fibre, in certain districts in the vicinity of the city of Swatow, appears in the *Journal of the Royal Society of Arts*, September 5, 1919. It seems that in these districts there are pine-apple plantations especially cultivated for the fibre, the annual estimated production being valued at £4,800. As will be seen from the description of the process of manufacture, it is a very simple one. The green leaf, having been first soaked in lime-water, is scraped by hand with a piece of broken earthenware or glass. The fibres are pulled out by using the thumb nail and forefinger, and after having been washed, are sun-bleached. A hundredweight of leaves will only give about a pound of fibre.

The process of twisting the fibres of the thread is managed entirely by women who, roll two fibres together, always on their knee.

The native loom is entirely used in weaving these threads into cloth. The ordinary width of the cloth is between 15 and 16 inches, and the maximum width between 18 and 20 inches. The length of the cloth varies from 80 to 100 feet, and different grades are made. This cloth, known as grass cloth, is widely used for summer clothing. Its manufacture, however, can only be undertaken where time and labour do not seem to be of much value.



INSECT NOTES.

THE TOAD IN THE WEST INDIES.

In the last number of the *Agricultural News* the Insect Notes referred to the suggestion that the toad and skunk should be introduced into Porto Rico, where it was expected that they would function in the control of insect pests of growing crops. This has special reference to the need for some agency for the control of the May beetles, the grubs of which are a serious pest of sugar-canes in that island.

In the Notes and Comments in the same issue of the *Agricultural News* a warning was given about the possibility of danger in introducing the American skunk into one of these tropical islands, because of the lack of knowledge as to how such an animal would adapt itself to its new environment.

The common toad in the West Indies is *Bufo marinus* or *Bufo agua*. It is called in most of the islands the 'crapaud'. According to the 'Cambridge Natural History', this species ranges from the Antilles and Mexico to Argentina. Apparently it does not occur in the Virgin Islands and Porto Rico, since steps are being taken to introduce it into Porto Rico and Santa Cruz.

Prof. A. E. Verrill in his book 'The Bermuda Islands,' records this species, and gives as common names the Great Surinam Toad or Agua Toad. The Surinam toad as given in the 'Cambridge Natural History' is an entirely different animal, belonging to a different sub-order, and of very different structure and habit, and Verrill's illustration reproduced from photographs from life, evidently represents the West Indian toad, and not the Surinam toad.

This toad is well known as an insect feeder, and it is said to devour even larger prey. Verrill states that 'in Barbados and Jamaica it is valued because of its habits of catching field rats and insects. In the stomachs of those I dissected were only wings and other fragments of cockroaches and ground beetles, with some fragments of dry twigs, probably swallowed accidentally.' Insects of all sorts are included in the diet of this animal. In Barbados it is not uncommon to see toads under the electric lights in the streets feeding upon the insects which are attracted by the light, and fall to the ground. The ordinary black hard back forms a considerable part of the food obtained in these situations.

The toad is nocturnal in habit, going in search of its food in the early evening, and remaining quiet, hidden or partially hidden, in a cool, damp place during the day, but on occasions it ventures forth during the day. In cotton fields badly attacked by the cotton worm, toads are sometimes very numerous, and they have been observed to eat many cotton worms. On one occasion a toad in a cotton field was fed thirteen of these worms in quick succession. A cotton worm was thrown on to the ground just in front of the toad. As long as the caterpillar remained motionless the toad apparently took no notice. The first wriggle attracted attention, and with the next the caterpillar disappeared, snapped up by the long tongue. After a few caterpillars had been taken, the toad seemed to realize that it was being fed, and there was less waiting and watching; sometimes the caterpillar was snapped up as soon as it fell to the ground.

The brown hardbacks which at present are attracting attention as pests in Barbados, Antigua, and Porto Rico are, from their habits, liable to be eaten by toads. The adult beetles burrow into the ground where they hide during the day and come out at night. The toad being nocturnal would be likely to find many of these beetles as they left the ground or returned to it.

It is said that in many of these islands the toad is less abundant than formerly. The late Dr. C. J. Manning, writing on the Birds of Barbados in the *Education Gazette* for August 1914, refers to the absence of surface ponds in that island as compared with former times as explaining, in part, the decreased number of migratory birds which visit Barbados at the present time.

His notes would seem to have a bearing on the decreased numebr of toads. According to this observer, the planters of Barbados have completely changed the physical aspect and conditions of the island during the past fifty years. Formerly each of the 400 and more estates in the island had at least one pond, and most of them had more, and it is estimated that there were over 1,000 ponds all brimful of water during the wet season. Apart from these, there were water courses, ravines, etc., all holding water in the rainy season. There was a good deal of pasture land and many trees. Now the ponds have all been drained, many pastures have been planted, ravines and gullies have been very much cleared, so that they provide for a quick run-off of the water. The trees have been cut down to a very large extent. The drainage of the ponds has removed to a large extent the natural breeding places of the toads; the converting of the pastures have reduced their feeding grounds to some extent; and the removal of the trees has made the island drier, not by reducing the amount of rainfall, but by allowing for the uninterrupted sweep of drying winds across the island.

Toads require water for their breeding places. The eggs are laid in long strings; the tadpoles which hatch from these are aquatic, without legs, swimming by means of a fleshy tail, which is lost as the legs are developed. When this happens the young toads leave the water and start on a terrestrial life.

Mr. E. G. Smyth, Entomologist on the staff of the Insular Experiment Station, Porto Rico, who recommends the introduction of the toad into that island, suggests transporting the egg-masses from the United States or Mexico. It would seen to be simpler to collect a few toads in one of the West Indian islands, where they are abundant, and introduce them. They are able to subsist for some time without food, and it would seem to be a simple matter to transport them short distances in any numbers desired.

The mongoose is blamed for helping to keep down the numbers of the toad, but it is doubtful if the mongoose is responsible for any large reduction in their numbers. The toad is possessed of a warty and repulsive looking skin, which is said to be poisonous, and it is said also that the parotoid glands secrete a poisonous substance, which can be ejected as a fine vapour when the toad is roughly treated or much irritated. Verrill ('The Bermuda Islands') states that a member of his party in Bermuda was able to observe this discharge of vapour from the mouth of the toad.

It is known that dogs that worry toads and mouth them are liable to convulsions, and they are said to die as

a result of the poison. It is likely that this poison would provide fairly efficient protection against the mongoose.

It is believed that cotton worms which have fed on leaves to which Paris green or other poisons have been applied, cause the death of many blackbirds in Barbados, and in fact it is said that dead blackbirds have been found in cotton fields, when the only reason that could be ascribed for their death was the eating of poisoned worms. If this is true, there seems to be strong probability that toads might be killed in the same way by eating cotton worms which have been poisoned and have dropped to the ground. The known facts are, that the toad is a most useful insect eater, and that many of their breeding places have been eliminated in islands such as Barbados and Antigua where certain insects are more serious pests than formerly. It is assumed that toads are less numerous than they were, and that the doing away with surface ponds has been largely responsible.

H. A. B.

CATTLE GRAZING IN BRITISH GUIANA.

The following statements occur in the Report on the Lands and Mines Department, British Guiana, for 1918:—

The cattle-grazing industry has continued to attract much attention. At the close of the year under report negotiations were pending between a local syndicate and the Government, for a Grazing Concession embracing an area of 2,000 square miles of savannah land in the extreme southern portion of the colony between the Quitaro and Takutu Rivers.

The coastland savannahs, which are now defined under the new Crown Lands Regulations of 1919 as the savannah lands lying North of 5° North Latitude, East of the Essequibo River and West of the Essequibo lands lying North of the Cuyuni, comprise an estimated area of 5,800 square miles, and may be sub-divided into two parts of approximately equal area: (1) the savannahs situated on the low flat alluvial coastlands which are for the most part 'wet' or swampy, and are fertile, and (2) those extending inland between the rivers to the East of the Essequibo River, and forming somewhat elevated and undulating sand downs which are not at all fertile.

Ten applications were received for Grazing Leases on the coastland savannahs, covering an area of 29,859 acres on the Abary, Courantyne and Canje Rivers, and the West Coast of Berbice, and eleven yearly Grazing Permissions, covering an area of 3,779·83 acres were issued in addition.

The interior or Hinterland savannahs of the colony, which are situated entirely within the western portion of the Hinterland, and separated from the coastland savannahs by extensive intervening forests, cover an estimated area of 6,190 square miles, which comprise extensive grass-clad plains elevated 3,000 feet above sea-level, and include grass-clad mountains.

For the interior savannahs six new permissions for grazing rights, embracing an area of 290 square miles were applied for and issued before the close of the year.

The construction of the cattle track from the Rupununi to the Berbice River, which was begun last year, was pushed ahead under the direction of Mr. H. P. C. Melville, Commissioner Rupununi District, and was practically completed by the end of the year. Arrangements were made by the Government for a topographical and economic survey of the trail and the country on each side of it for a width of 5 miles, to be commenced early in 1919.

Those interested in the question of cattle-raising in the colony are recommended to read the interesting and instructive articles on the subject written, respectively, by Mr. John Hollis, Chief Clerk Department of Lands and Mines; Mr. John H. Haly, Manager of the Abary Cattle Ranch; and Mr. A. E. Bratt, Manager Plantation Providence, appearing in the *Journal of the Board of Agriculture of British Guiana*, for the quarters ended March and October 1918, respectively.

SELECTION OF RUBBER TREES.

In regard to the selection of Hevea rubber trees in Ceylon, referred to in the editorial in the present issue of the *Agricultural News*, the suggestions put forward recently by a writer in the *India Rubber World* (October 1, 1919) are deserving of attention.

The procedure to be followed in order to obtain the best planting stock should, according to this writer, be as follows: a number of the oldest trees to be found growing under the same conditions should be selected. It is important to select the oldest trees in order that one may be certain that the trees have not suffered from disease, and may therefore be regarded as immune. Presuming that of those oldest trees those which show no evidence of ever having been attacked by disease are selected, it remains to select from the remainder the highest yielders. If two or more trees yield about the same quantity, the choice should fall on the tree producing the best quality of latex. This latter point is of less importance than yield and disease resistance, unless very great differences should be found in the course of the experiments.

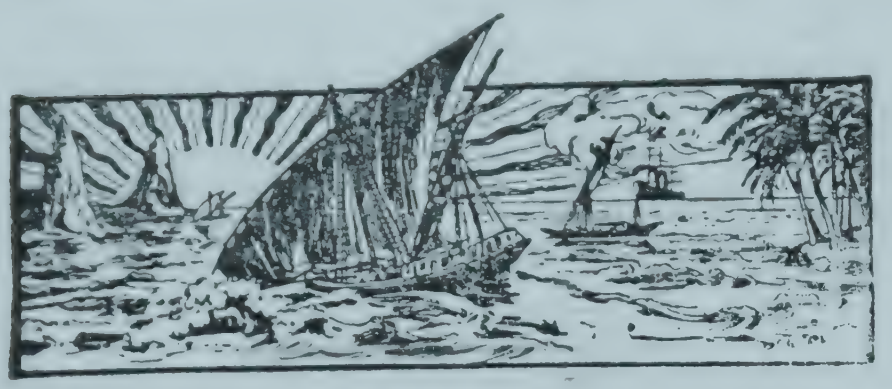
In summarizing his article, the writer says: 'The present method of reproducing Hevea should be discontinued. Breeding to obtain a better strain is, for technical reasons, out of the question for any commercial firm. Seedling selection offers no solution on account of the inability to know what to select. Artificial propagation will overcome the difficulty. Methods of artificial propagation may be divided into two groups: those providing for their own root systems, and those where one tree is grafted upon another. One of the simplest methods is that carried out lately in Sumatra, namely budding. When resorting to budding or grafting, it is important to remember that attention must be given to the selection of the stock principally in regard to resistance to disease.

'Carefully selected trees should be used for propagating stock, taking into account productivity, disease resistance, and quality of the rubber.'

DEPARTMENT NEWS.

Sir Francis Watts, K.C.M.G., D.Sc., Imperial Commissioner of Agriculture for the West Indies, returned to Barbados on November 16, 1919, by the S.S. 'Spheroid', after five months' duty in England.

Mr. W. Nowell, D.I.C., Mycologist on the staff of the Imperial Department, returned to the Head Office on November 24 by the C.R.M.S. 'Chaudiere' from Trinidad, after several weeks' visit to that Colony in connexion with investigations into froghopper and root disease of the sugar-cane.



GLEANINGS.

A new sub-species of oil palm (*Elaeis guineensis*) is referred to in the *Kew Bulletin of Miscellaneous Information*, No. 5 of 1919. The leading feature of this variety is the persistent fleshy skin which, like the seed, is rich in oil and surrounds the fruit like a cupule.

An illustrated account of the botanic gardens of Pampoemousse appears in the *Kew Bulletin of Miscellaneous Information*, Nos. 6 and 7, 1919. The Pampoemousse tree is a sort of orange (*Citrus decumana*) probably brought from Java by the Dutch. The fruit is an orange of slightly bitter sweet flavour.

According to the *Colonizer* for September 1919, an aeroplane expedition has been formed for the purpose of ascertaining the value of wood pulp resources of Labrador. Photographs of all the large forests will be taken, and from these the value of the wood pulp will be calculated. Four aeroplanes are to be used in the undertaking.

In the section on rural credit, Seventeenth Annual Report of the Bureau of Agriculture, Manila, the statement is made that it has been a constant surprise to note the facility with which the credit associations (corresponding to West Indian credit societies) have carried on their work when once the details of the plan were understood by the members.

Although the total gasoline imported into Great Britain last year from British possessions was only 8,340,540 gallons compared with 22,274,885 gallons in 1916, it is satisfactory to note that (according to the *Westminster Gazette*, October 16, 1919) there was an increase in the imports from the West Indian islands rising from 196,297 gallons in 1916 to 2,214,930 gallons in 1918 The reference to 'islands' is obviously due to ignorance or oversight. The only island at present exporting oil is Trinidad.

A simple drinking fountain for fowls, constructed by means of a common beer bottle, is described in the *Queensland Agricultural Journal* for August 1919. First make a stand for the bottle out of two pieces of wood one horizontal, the other perpendicular. To the perpendicular piece attach two wires to hold the bottle mouth downwards in a vertical position. Then put a soup plate in a dish full of water on the horizontal board. Fill the bottle, cork it, then invert it over the dish. Take out the cork, being careful that the mouth of the bottle touches the surface of the water. There will be a supply kept up as long as there is water in the bottle.

The Egyptian hen, it is curious to note, does not possess the sitting instinct. This is attributed to the practice of artificial incubation which is generally followed in Egypt. It is contended by those who have investigated the subject, that the art of hatching eggs by artificial heat originated in Egypt in very remote times. (The *Journal of the Department of Agriculture of Victoria* for July 1919.)

Professor Bateson in an article on plant breeding and tropical crops in *Production* for July 1919, points out that it is not sufficient to choose coco-nuts from good trees, since this only takes into consideration which trees are the best mothers; attention should be given to the paternity of the seeds chosen. He also states that exhaustive investigation might prove that the coco-nut can be reproduced vegetatively

Reference is made in the *Philippine Agricultural Review*, Vol. XII, No. 2, to an experiment designed to improve certain varieties of rice selected from the variety test by means of plant selection through the head-to-the-row culture. This test consisted of seventeen varieties, representing bearded and non-bearded, early, medium, and late-maturing plants, so as to establish improved varieties to meet all local conditions and requirements.

The Secretary of the Department of Scientific and Industrial Research, London, informs *Nature* that a British association of research for the cocoa, chocolate, sugar, confectionery, and jam trades has been formed in accordance with the Government's scheme for the encouragement of industrial research. The Secretary is Mr. R. M. Leonard, the Manufacturing Confectioners Alliance, Ltd., 9, Queen Street Place, London, E.C., 4.

The depth to plant bananas is the subject of an interesting note in the *Agricultural Gazette of New South Wales* for August 2, 1919. Slips were set in at 6, 9, 12 15, 18, and 21 inches deep. The best stool at present is from the plant set 15 inches deep, it having five stems and two suckers. The test will not be completed until the plants mature fruit, but in the meantime the results afford some indication of the best depth to plant bananas in New South Wales.

An extensive and efficient irrigation service for sugar-cane exists in Porto Rico. The new system of overhead delivery was completed in 1914, and the cost was defrayed by bonds issued, totalling $5,000,000. Funds to meet interest charges and payments of principal, as well as operation and maintenance expenses are provided by a special tax on the lands benefited. The total area irrigated is about 40,000 acres. Further information will be found in *Facts About Sugar* for September 27, 1919.

It is stated in the *Journal of Agricultural Research*, August 15, 1919, that removing pulp from camphor seed was found to hasten germination by an average of two weeks; it also gave an increase in germination of approximately 525 per cent. over that of unpulped trees. It is believed that in commercial plantings the removal of the pulp from the seeds will increase the percentage of germination by at least 200 per cent., thus producing 40,000 more seedling trees to each acre of seed bed. The estimate is believed to be very conservative, and even a much greater increase may be expected.

VARIATION IN HEVEA BRASILIENSIS.

A paper of considerable importance and interest to those engaged in the Para rubber industry has been published in the *Annals of Botany*, Vol. XXXIII, No. CXXXI, July 1919, p. 313, by Mr Stafford Whitby, M.Sc., A.R.C.S., of McGill University, Montreal, Canada.

The paper embodies the results of the observations made by the author in the Federated Malay States, as to the extent to which variation occurs in the amount of rubber yielded by individual trees of *Hevea brasiliensis* of the same age and growing under the same conditions. He also investigated the possible correlation between the yield of rubber and the girth of the trunk. Some 1,000 trees, seven years old, in a normal plantation covering about 13 acres were carefully studied, the trees being in their third year of tapping. As the Eastern plantations have been made with trees raised from non-selected seed, the results of the investigation are of particular interest. Great variations were found in the rubber content of the latex (the 'strength' of the latex) from different trees, and appeared to be constant and characteristic for the individual tree. Some trees yielded only 23 grms. of rubber per 100 c.c. of latex, while at the other extreme, trees were found yielding as much as 54-55 grms. of rubber per 100 c.c. of latex, the mean for the 245 trees examined in this connexion being 36·58 grms. per 100 c.c.

The author concludes from his observations on older trees, that as a tree grows older, the rubber content of the latex yielded by it increases 1-2 per cent. per annum. The results are set out in tabular form, and while only relatively few trees show the lower percentages of from 23-29 grms., and the higher from 44-55 grms., the majority yield amounts varying from 30-43 grms.

With regard to yield of rubber, it was found that individual trees were comparatively constant, and from observations extending over two years, it is stated that a tree which was found to be a high yielder at one time could be relied upon to give a high yield at all times. The yield-results are summarized in a table and by means of a curve, and embody the examination of 1,011 seven-year-old trees.

The mean yield in grammes per day came to 7·12 grms., but some few trees yielded more than 27 grms. a day, and for a large number the yield was from 0-2 grms. Thus from 9·6 per cent. of the total number of trees 28 per cent. of the total yield was contributed, while 13·7 per cent. (0·2 grms. group) only gave 2·9 per cent. of the yield, and certainly did not repay the cost of tapping. Four outstanding trees in the plantation gave 41·45, 41·56, 41·72, and 42·77 grms per day.

The great possibilities of seed selection in improving rubber yield are very clearly indicated from these figures

A further important observation in connexion with seed selection to which Mr. Whitby draws attention, is that the seeds from any one tree are exactly similar in appearance as regards tint, mottle pattern, and shape.

It now remains to be seen whether seeds from a high-yielding tree will give rise to trees similar to the parent. This is hardly likely to be the case under present plantation conditions, where high- and low-yielding trees are indiscriminately intermixed. But it does seem to be indicated that if high-yielding trees can be segregated, and provided that pollen of poor-yielding trees be prevented access to the flowers, seeds capable of producing trees yielding a high percentage of rubber would be assured.

The author also gives particulars of the correlation between yield and girth, which indicate that though there is a definite correlation—trees with a large trunk being good yielders and those with small trunks being poor yielders—it is not sufficiently well indicated to be of great value in eliminating trees from a plantation.

It is of interest to notice that A. A. L. Rutgers ('Selectie en Uitdunning,' Archief voor de Rubber culturer, 1919, 3, pp. 105-23) has made observations in Sumatra in full accord with those of Mr. Whitby, and finds that 'good trees remain good, poor trees remain poor.' (From the *Kew Bulletin of Miscellaneous Information, No. 8* of 1919.)

INCREASING THE YIELDS OF TOMATOES.

An abstract in the *Experiment Station Record*, Vol. XL, No. 9 deals with hand pollination of tomatoes, and shows that this method, if carefully carried out, gives increased yields to an extent that should pay handsomely. In connexion with increasing the yield of tomatoes, see also the *Agricultural News*, Vol. XVII, p. 4.

Hand pollination of flowers has reduced the number of unfruitful blossoms from 66 per cent. to 20 per cent. of the total number of flowers produced, the percentage of reduction depending upon the comparative thoroughness of the pollination For various causes difficult to control, when working with a large number of blossoms, a reduction below 20 per cent. of unfruitful blossoms seemed to be impossible. The average fruitfulness in typical plants of fifteen crops of tomatoes was 72 per cent. for pollinated blossoms and 36 per cent. for unpollinated blossoms. The average yields for pollinated and unpollinated plants were 7·4 and 4·4 lb. of tomatoes, respectively. The percentage of fruitfulness and unfruitfulness of individual clusters of a crop given specific treatment varied to a considerable extent, but total and average records indicated a remarkable mean of percentage of uniformity of all clusters.

Of various methods of pollination tried, the emasculation method has been more widely used than any other, and is recommended principally because of ease in applying pollen, prevention of duplication of pollination, and thoroughness of application at a time when the flower is most receptive. Details developed at the station in using the emasculation method are described.

Hand pollination of blossoms stimulated early development of the fruit as compared with naturally pollinated blossoms. Fruits produced from hand-pollinated flowers have been harvested as early as twenty-one days before fruit from plants not artificially pollinated. The author points out that the cost of pollination for the entire season, which was approximately 3c. per plant, may be covered by increased yields from pollinated plants in the first two weeks of harvesting, when higher prices prevail. The comparative net returns of plants after deducting the cost of pollination show an increased value of from 16c. to 67c. a plant or an average of 38c. a plant for pollination.

It is pointed out that whereas regularity and thoroughness of pollination are conducive to high plant yield, inexperienced labour, haste, and irregularity in doing the work may not produce profitable net results.

No. 3 of the 'Studies of Tropical American Phamegrams,' issued by the United States National Herbarium, has been received This and previous issues contain important keys to species, and the description of many species regarded as new.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Routine work in the Botanic Gardens was maintained during the month of October. The following comprised the plant distribution for the month: lime plants, 500; ornamental, 3; horse beans, 50 lb.; melon papaw seeds, 1oz.; onion seeds, ¾ lb. 15 oz.; onion seedlings, 100. The Acting Superintendent, Mr. W. O'Brien Donovan, states, in reference to staple crops, that the reaping of cacao is in full swing. Indications are that a crop somewhat larger than that for 1918-19 might be expected. The market continues firm, at very good prices. Live stock for butchers' meat continues scarce. It is believed that this scarcity will increase rather than decrease with the process of time. Sweet potatoes are being largely planted. A fair crop of first corn has been obtained, and a second planting is now in progress. Thrips have again hit hard some places The attacks, however, comparatively speaking, have been less severe than those of last year. It is noted that the estates suffering mostly are those which have only now begun treatment by prescribed remedial measures. The judging of the gardens (ground provisions) under the Scheme of Prize Holdings Competitions has been completed by officers of the Department. Assistance in the adjudication for prizes was given by some planters, members of the Agricultural and Commercial Society. Intermittent showers fell throughout the month. The precipitation at Richmond Hill was 9·10 inches. A series of lectures is contemplated with a view to the formation of Rural Credit Societies.

ST. VINCENT. Work in the Botanic Gardens during October consisted in a general clearing of drains, trimming of ornamental borders, weeding and edging of walks and beds. There was a good supply of coc-onut plants in the nursery for sale. Plant distribution included 5,800 cane cuttings, 6 grafted mango plants, 106 decorative, and 5 lb. onion seed. Regarding staple crops, Mr. S. C. Harland, B.Sc., Assistant Agricultural Superintendent, states that the cotton fields generally are satisfactory, although signs of soil exhaustion are everywhere apparent. Some damage has been done by the Soft Rot and Diplodia diseases. The cotton worm is reported to be attacking cotton fields at Ratho Mill and Villa in the Windward district. Mr. W. N. Sands, F.L.S., the Agricultural Superintendent, left the colony for England on October 16, to take up his new appointment as Assistant Economic Botanist on the Staff of the Agricultural Department, Federated Malay States. Seasonable weather prevailed during the month. The rainfall recorded at the Botanic Station was 13·05 inches, and at the Experiment Station, 9·66 inches.

ANTIGUA. The following plants were distributed from the Botanic Gardens during October: 1,683 eucalyptus, 276 mahogany, 270 sisal, 17 miscellaneous decorative, 73 miscellaneous economic, 41 Prosopis, 1 coco-nut, 200 Gliricidia cuttings, and 3 lb. onion seed. Ordinary routine work was performed in the Experiment Stations and Botanic Gardens. Good rains fell during the month, and these the Curator Mr. T. Jackson, says, have materially affected the outlook of the sugar crop for the year 1919-20. If normal weather is experienced during the next few months, it is possible that the island will make about 14,000 to 15,000 tons of sugar. The crop is looking well and growing rapidly in all parts of the island, with the possible exception of some portions of the Popeshead district. This district has not received the same amount of rain as other localities, and in consequence of the lightness of the soil, it suffered more acutely than other places during the recent drought. Returns as to the area under cotton have not yet been received, but it seems likely that the area planted will be smaller than that of last year. Onion seed has germinated well. Regarding pests, it is stated that the numbers of cotton stainers have increased slightly during the month; some attacks of caterpillars have been experienced; and investigations in connexion with hard back beetles were continued. Good rains fell during the month, aggregating 7·82 inches. The total rainfall for the year to date is 31·73 inches.

Appended to the above notes forwarded by Mr. Jackson, is a brief report by Mr. V. G. Pereria, on Agricultural Instruction in Antigua for the month of October. This discloses that fourteen peasants' holdings were visited during the month. Fairly good yields of cotton were being obtained, with little or no stained cotton. Leaf blister mite was present in most holdings, and especially common in that part of Piccadilly known as Cuba. The cause of tis was found to be the presence of old cotton trees growing in the neighbourhood, which could not be easily observed on account of high grass and weeds that had grown up amongst them. Cotton stainers were present in some holdings, and were beginning to increase. Control of these by means of collecting, or by trapping, was advised. Boll shedding had occurred in a few holdings but not to any great extent. No cotton caterpillars had appeared during the month. The planting of sweet potatoes was continued, and land was being prepared for the planting of corn.

ST. KITTS. Mr. F. R. Shepherd, Agricultural Superintendent, writes to say that during the month of October the usual routine work was carried out in the Botanic Gardens, which have much improved since the good rains recently. Plants of Casuarina have been put out along the sea-front of the Station. Plant distribution included: 30 ornamental plants, 24 ears of Indian corn, 5 lb. Spanish peanuts, 300 cassava cuttings, and 100 sweet potato cuttings sent to the Experiment Station, Nevis. In addition, cuttings of varieties of cassava were sent to the Bureau of Plant Industry, Washington. The sugar-cane crop has considerably improved, especially in the Valley district, owing to the goods rains during the month, and the prospects are now very favourable for the coming season. The plant canes are vigorous and healthy, while the ratoons are responding to the artificial manures applied. On some estates, fields for the crop of 1921 are being planted chiefly with B. 147. The cotton crop in the Northern district is practically over, the plants are being ploughed under and the lands prepared for cane. The yield of cotton per acre has been satisfactory. In the Valley district picking is still in full swing. Leaf-blister mite is appearing, but not to any great extent. Cotton stainers have been found in small numbers in the Government Cotton Farm, but constant hand collection in tins with kerosene oil has prevented any increase. As far as can be seen, this pest has been considerably reduced this season, and if it does not now appear, a second picking of cotton will be obtained from lands not needed for cane.

NEVIS. There was no plant distribution during the month of September, Mr. Howell writes to say. The cane crop throughout the island is suffering very much from want of rain, and many of the cane fields are drying up. Cotton picking is in progress, but with very poor returns. The late planted cotton is doing very badly on account of the very dry weather, and it is very doubtful whether any cotton will be reaped from many of the fields, especially in the lowlands. The rainfall for the month was 2·10 inches; for the year to date, 19·67 inches.

VIRGIN ISLANDS. According to notes forwarded to this Office by Mr. E. Maduro, Acting Curator, concerning operations at the Experiment Station, Tortola, during the months of July and August, the usual routine work seems to have been performed. Plant distribution during the period covered, included 149 lb. cotton seed, 24 ornamental plants, and 300 potato cuttings. The staple crops are reported to be in fair condition. Refreshing showers in July have brightened up things considerably, and the land is again in full bloom. Scarcely any pests were seen to attack plants. The only pests which seem to be plentiful is *Batocera rubus*. The weather was more favourable in July than in August. The rainfall registered at the Station in July amounted to 72·5 inches; in August the precipitation was only 1·32 inches.

AGRICULTURE IN BARBADOS.

The closing days of October were showery. Indeed, over a large area in the the hilly districts the rainfall during the last ten days of the month reached a total of 3 inches. In practically the whole island November found the soil fairly moist and vegetation making progress, and by the 5th instant a total of 1½ inches had been registered, made up of light showers on the first three days and followed by a rain of over 1 inch on the 4th instant. Since this date, however, nearly one half of the island has had a dry time, and vegetation, although green, is beginning to show signs of thirst.

While this is the situation in the south of the island and in the extreme north, a very heavy rain fell before sunrise on the 10th instant over the whole of St. Joseph, St. John, and St. Andrew, and extended as far as the hills of St. Thomas, St James and St. Peter.

At this date last year the whole island had recorded for November a rainfall of 3 inches most satisfactorily distributed. The rainfall for the year to date is about 10 inches short of last year's total in the hilly districts, about 14 inches in the centre of the island, and about 16 inches in the southern part.

Cane planting is being generally started in the black soil, although there are some estates which will not begin until the first week in next month. Some planters think that the canes they have decided to cut for plants are not yet sufficiently matured for the purpose. On many estates in the red soil, that part of the island, which, as a rule, plants later, a fair acreage of the B. 6450 has already been planted.

As stated in a recent report, the testimony of planters varies considerably concerning the merits of our best-known seedlings. We are, however, now in a position to state that, while on some estates only a small area of the B.H.10(12) will be planted, this seedling will, on the whole, be the favourite. It seems that on a large number of estates one half the young crop will be planted in the B.H.10(12), the remaining half being divided between the B. 6450, the Ba. 6032, and any other seedling or seedlings now in the experimental stage

To the seedlings mentioned in our last report we would add the B. 11403, We would strongly advise that experiments of an extended character be made with this seedling, and with the B.S.F.12(27), and the B. 11569. To do this, small plots should be put in various districts of the island during this planting season. We have recently heard the following remark made in connexion with seedling experiments: 'Stick to what you have got' Such a spirit is unscientific: it is also unsafe.

We should have not three well known seedlings but three and twenty, if possible, with additions at interval.

Cultivation for the young cane crop is well advanced in the black soil. The only complaint is that there is great shortage of farmyard manure. On red soil estates, too, there is considerable shortage of farmyard manure, and some fields will be fertilized with applications of early cane manure and sheep manure only. Practically everywhere there is a struggle to obtain manure of any kind sufficient to fertilize the fields to be planted this season.

The old plant canes everywhere have made rapid strides, but, of course, some fields are still very low for this time of the year. They are, however, healthy and green, and the bunches are full. The deep green of the fields sometimes rivets the eye and causes feelings of pleasure and admiration.

The same cannot be said of the ratoons Many fields which showed early signs of breaking down have further depreciated, and some will do little more than supply fodder and litter. On the other hand, there are some excellent fields of first ratoons of all the seedlings, and we are of opinion that the breakdown in the fields of either first or second ratoons has been the result of poverty and not of disease.

Potatoes have been more plentiful during November, having been retailed at 6 and 7 pounds for 10 cents. This is doubtless due to the fact that fields are being cleared for the planting of canes The fields of fall potatoes recently planted, are making a satisfactory start, and there should be a fair yield if showery weather prevails until the middle of January. (The Barbados *Agricultural Reporter*, November 15, 1919.)

Cacao at Havre.—From a report issued by the *Port-of-Spain Gazette* for October 29, 1919, it would seem that stocks of cacao in Havre have again increased considerably, having reached the very large total of 372,480 bags during September, divided as follows :—

	Bags. 1919.	Bags. 1918.
Accra	127,679	1,485
Bahia	40,154	3,869
Grenada and St. Lucia	5,664	13
Guayaquil	94.175	6,478
Haiti	20,152	807
Martinique, Guadeloupe	793	3,213
Para	11,166	985
San-Thomé	19,361	550
Sanchez Puerta Plata, Samana	3,737	457
Trinidad	32,898	12,154
Venezuela	15,362	6,603
Sundries	15,336	2,312
	372,480	38,928

Against in 1917 59,570 bags.
,, 1916 63,405 ,,
,, 1915 66,052 ,,

The plant distribution from the Botanic Station in St. Lucia for October 1919 consisted of the following : limes, 750 ; grafted mangoes, 14 ; grape fruit, 30 ; oranges (budded), 5 ; cacao, 100 ; economic plants, 7 ; gliricidia cuttings, 30 ; onion seed, 4 oz. ; vegetable seeds, 10 packets. Observations relating to staple crops showed that a good cacao crop was being harvested while the lime crop was still coming in. The rainfall at Castries for the month was 7·71 inches, while that at Choiseul for the same month was 4·77 inches

MARKET REPORTS.

London.—The West India Committee Circular, October 16.

Balata—Venezuelan Block, no quotations ; West Indian Sheet, no quotations.
Beeswax—No quotations.
Cacao—Trinidad, 125*s.* to 126*s.*; Grenada, 118*s.* to 126*s.*; Jamaica, St. Lucia, St. Vincent, and Dominica, no quotations.
Copra—£55
Honey—Jamaica, 72*s.* 6*d.* to 90*s.*
Lime Juice—Raw, 2*s.* 3*d.* and 2*s.* 6*d* ; Concentrated, no quotations.
Pimento—5½*d.*
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

Barbados—Messrs. T. S. Garraway & Co., November 12.

Arrowroot—$9·00 per 100 ℔.
Cacao—$22·00 to $24·00 per 100 ℔.
Coco-nuts—$45·00 husked nuts.
Hay—$4·50 to $4·75 per 100 ℔.
Onions—$15·00.
Peas, Split—No quotations; Canada, Market bare.
Potatoes—$13·00 per barrel
Sugar—Market bare.

London.—The Perfumery and Essential Oil Record, October 21, 1919.

Bay Oil—16*s.* to 18*s.*
Lime Oil—Flat, at 3*s.* 9*d.* to 4*s.* for West Indian distilled, and 11*s.* for hand-pressed.
Orange Oil—West Indian sweet, 8*s.* 6*d.* to 9*s.* ; bitter, 9*s.* to 10*s.*

Trinidad.—Messrs. Gordon, Grant & Co., November 5

Cacao—Venezuelan, $26·00 ; Trinidad, $25·00 to $26·00
Coco-nut Oil—$1·65 per gallon.
Coffee—Venezuelan, 26c. per ℔..
Copra—8c. to 8½c. per ℔.
Dhal—$10·25.
Onions—$10·00 per 100 ℔.
Peas, Split—$9·00 per bag.
Potatoes—English, $4·00 to $4·50 per 100 ℔.
Rice—Yellow, $12·00; to $13·00 White, $12·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., October 3.

Cacao—Caracas, 28c. ; Grenada, 24½c. to 24¾c. ; Trinidad, 24½c. to 25c.; Jamaica, 20½c.
Coco-nuts—Jamaica selects, $88·00; Trinidad $88·00; culls, Jamaica, $60·00 ; Trinidad $60·00 per M.
Coffee—Jamaica, 20½c. to 24c. per ℔.
Ginger—21c. to 24c. per ℔.
Goat Skins—Jamaica $1·60; Antigua and Barbados, $1·60; St. Thomas and St. Kitts, $1·50.
Grape Fruit—Jamaica, $5·00 to $5·50.
Limes—No market.
Mace—40c. per ℔.
Nutmegs—19c. to 19½c.
Oranges—$2·50 to $3·00.
Pimento—9¼c. per ℔.
Sugar—Centrifugals, 96°, 8c.; Muscovados, 89°, 7c. Molasses, 89°, 6½c. all duty paid.

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WHITE PARK.
October 9, 1919.

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St. Vincent: Mr. J. D. Bonadie, 'Times' Office.
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Dominica: Mr. J. R. H. Bridgewater, Roseau.
Montserrat: Mr. W. Robson, Botanic Station.
Antigua: Mr. S. D. Malone, St. John's.
St. Kitts: The Bible and Book Supply Agency, Basseterre.
Nevis: Mr. W. I. Howell, Experiment Station.
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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

	PAGE.		PAGE.
Agriculture in Barbados	388	Plant Diseases:—	
Bean Dish, A New ...	387	Red Ring Diseases of Coco-nuts	398
Camphor	387	Rats and their Extermination	399
Canada-West Indian Trade...	392	Report of the Imperial Department of Scientific and Industrial Research	393
Cotton Notes :—		Root Nodules and Casuarina	393
Origin of Sea Island Cotton...	390	Sea-side Grape Tree ...	397
Sea Island Cotton Market	390	Transport, A New Form of	387
Gleanings	396	Trinidad, Agricultural Re-organization in ...	393
Insect Notes :—		Umney, John Charles, The Late	392
Locust in British Guiana	394	War Materials as ... ... Fertilizers	393
Summery of Entomological Information 1919	394	Waste in Movement Stopped	395
Items of Local Interest	388	West Indian Products ...	399
Momordica cochinchinensis	393	Weather in Antigua ...	389
Notes and Comments ...	392		

Camphor.

'CAMPHOR shortage in the United States has now reached the point where the existence of the American refiners' business is in danger of extinction. Coupled with the practical elimination of American refining, is the curtailment of Japanese refined camphor shipments to the United States.'

The above statements, reproduced recently in a contemporary journal, [1] taken into consideration with the present high prices that are ruling for camphor (for 'white' 200*s*. per cwt.) [2], make it appear probable that camphor cultivation is and will continue to be a very paying proposition.

The principal points connected with the cultivation of the camphor tree (*Cinnamomum Camphora*) have already been published in this Journal,[4] and reference has been made to the Japanese monopoly. The object of the present article is to discuss briefly the different kinds of camphor trees the degree of success that has attended the cultivation of camphor in different countries, including reference to pests and diseases, and finally to arrive at some decision as to the prospects before the establishment of a camphor-growing industry in the West Indies.

As already intimated, the production of camphor is at present almost entirely in the hands of the Japanese, who produce large quantities in the tropical territory of Formosa.

Organized efforts have been made, however, to grow camphor trees on a commercial scale in other countries, notably in the Southern United States, and in the Federated Malay States, and in Ceylon and Mauritius. For various reasons which are difficult to arrive at definitely, these efforts have not been particularly successful. In some cases it appears that disappointment has resulted through planting inferior strains; in some instances it would appear that some trouble has been occasioned by pests and diseases. In most circumstances, however, it is probable that, owing to the greater attractiveness of other crops which in former times were likely to pay better. the cultivation of camphor on plantation lines in the tropics has never yet been given a fair trial.

An essential condition for success is to plant the proper material. It appears from a comprehensive article on camphor cultivation in the United States[4], that no trouble in this respect has been encountered there. Distillation of the leaves and twigs always yielded distillates from which a high proportion of solid camphor—over 1·5 per cent.—has been obtained. When the camphor tree was first introduced into the United States is not clear, but several trees in Florida were brought in as seedlings, presumably from the East, between 1870 and 1875. From their seeds have been grown many of the camphor trees of that State.

In the Federated Malay States camphor was first grown experimentally in 1904 from seeds and seedlings imported from Japan. The trees produced, have yielded in most cases oil containing a satisfactory proportion of solid camphor, but the oil itself differs from the Japanese product, and is less valuable.[5] [1]

The camphor tree referred to here is *C. Camphora*; it is of interest to note that a camphor-yielding tree, *Dryobalanops Camphora*, Colebrook = *D. aromatica*, Gaertn., is indigenous to the Federated Malay States. This tree also occurs naturally in Borneo, and is indeed commonly known as Borneo camphor. It has a special use in the East, notably in China, for embalming purposes.[6] No definite information is available regarding its commercial value.

The introduction of the camphor tree into Mauritius has been less successful than in the case of the United States and the Federated Malay States. An examination of samples of oil from the Mauritius trees has shown these oils to contain no solid camphor, and the oils themselves differ greatly from the ordinary camphor oils of commerce obtained from China and Japan. [5]

In the West Indies, the situation in regard to the nature of existing camphor trees is becoming more satisfactory. In Dominica[7] recent distillations have shown that a number of plants introduced from Trinidad in 1911 are true camphor trees; the yield of solid camphor however is somewhat low, about 1 per cent. On the other hand, certain specimens in Dominica yield oil only. Plants of the true camphor trees are being raised for commercial planting As this work proceeds it will be important to prevent hybridization between the desirable and undesirable strains.

There is a small plantation of good camphor trees at St. Augustine, Trinidad, which have fruited this year. There is a well-grown camphor wind-break at the same place.

In the case of St. Vincent,[8] an old camphor tree over 100 years of age has been examined and found to be *C. Camphora*, var. *glaucescens*. This variety is always oil-yielding, so far as is known.

Before recommending the planting of camphor on a large scale in the West Indies, consideration should be given to possible contingencies, especially in regard to pests and diseases. In Florida much trouble has been occasioned by thrips,[9] which have caused the death of seedlings and young trees. The same species attacks camphor trees in Ceylon. Other pests of camphor include a leaf miner, a twig borer and a bag-worm. As regards diseases, in the Federated Malay States some trouble is caused by a thread-blight fungus which is identical with that attacking Hevea rubber.[10]

These maladies, however, appear to be controllable, and as far as one can judge, there is no reason to anticipate any serious trouble from pests and diseases in suitable localities in the West Indies.

For camphor there is undoubtedly a demand, and it is a product easily produced and transported. It is essential first of all to obtain proper planting material —material which will produce trees yielding a high percentage of solid camphor and oil of correct composition. The camphor tree suits a wide range of soils, but prefers well-drained soil of a light character. Clipping can be commenced systematically when the trees are four or five years old, and according to American estimates, an acre should yield about 200 lb. of marketable camphor. In order to allow the provision of an efficient distillation plant to obtain the camphor at a minimum cost, it is stated that at least 500 acres should be planted.

At present, in Dominica and other places in the West Indies, one is inclined to recommend the planting of camphor trees as wind-breaks and as hedges in as many different situations as possible. It will then soon be found which are the most suitable places for maximum growth, and on the basis of this experience it should be easy for planters to decide in the matter of more extensive planting along organized and plantation lines.

1 On Camphor Oil. *Perfumery and Essential Oil Record*, March 1919.

2 Decreasing Supply of Camphor. *Agricultural News*, Vol. XVII, p. 405.

3 Camphor Cultivation in the British Empire. *Agricultural News*, Vol. XVIII, p. 173.

4 Camphor Cultivation in the United States. *Year-Book*, United States Department of Agriculture, 1910.

A NEW FORM OF TRANSPORT

Sir Frederick Lugard, Governor of Nigeria, in his recent address in London on 'Moral and Material Progress in the British Tropical Dependencies,' referred to the Pedrail as the 'best form of roller-track vehicle yet devised.' He was speaking of the difficulties of transport in countries like West Africa, and declared that the development of the material resources of Africa might be summed up in the one word 'transport.' Sir Frederick went on to say that one of the advantages of the Pedrail was that it required no road in its locomotion, and, indeed, made its own in its own progress. Moreover, it was economical, for whereas human carriers when employed by Europeans conveyed goods at a cost of from 2*s.* to 2*s.* 6*d.* per ton mile, for long distances, the Pedrail claimed to carry at a cost of 3*d.* to 6*d.* a ton mile.

This information is taken from *West Africa* for November 8, 1919, which also gives the following technical account of this new vehicle :—

The Pedrail may be described as a flexible type of transport vehicle in which road wheels are discarded in favour of a form of mechanism for placing down on the road surface an endless succession of feet.'

The foot, or part coming directly in contact with the ground, has an area of such proportions that the pressure per square inch on the ground is from 5 to 10 or perhaps even 15lb. varying in different classes of vehicles, that is from one-fifth to one-half the pressure per square inch of a man walking. In the 1-ton size the feet are made of wood, but in larger machines pressed steel is employed.

The feet are attached to what are termed 'foot carriers' by means of a special resilient form of connexion which allows each individual foot to be displaced when turning corners, the resiliency of the connexions being sufficient to restore the feet to their original positions immediately the latter are relieved from pressure on the ground.

The foot carriers are linked together around the main frame of the Pedrail by means of steel trough-shaped slippers, forming an endless series. These are constrained to move around the frame of the Pedrail, the foot carriers laying down their respective feet successively, and lifting them up again after the vehicle has moved over them.

Around the edge of each Pedrail frame is fixed a hard steel rail or roller-way. Between this steel rail surface and the surface of the slippers is interposed a series of 'live' rollers, formed into a continuous chain. In its motion forward, the whole vehicle moves on these rollers. No driving strain whatever comes on these chains ; they are used simply and solely as an anti-friction medium. They are provided with two sets of rollers, revolving in planes at right angles to one another, so that pressure due to the vehicle running on a side slope is taken on 'live' rollers as well as that due to the vertical weight of the vehicle, friction thereby being reduced to an exceedingly small figure.

The shape of the Pedrail frame is important, inasmuch as on this depends the velocity at which the feet approach the ground.

At each end of the Pedrail frame, specially shaped sprocket wheels are provided, which gear with the chain of foot carriers, and in self-propelled Pedrail vehicles one of these sprocket wheel shafts is driven, whilst on the other sprocket wheel shaft brakes are mounted.

The body of the vehicle, which contains the load is mounted on the Pedrail frame by means of suitable bearers. Springs may be interposed between the body and the bearers, but for some purposes, the spring connexions attaching the feet to the foot carriers are found to provide sufficient springing for the load.

It is very probable that the Pedrail would prove useful in parts of the West Indies, particularly in British Guiana. The makers are Pedrail Transport Limited, Wyfold Road, Fulham, England.

A NEW BEAN DISH.

The following interesting note has been supplied by Mr. A. E. Collens, F.I.C., Acting Government Chemist and Superintendent of Agriculture for the Leeward Islands :—

It may be desirable to point out that recent trials I have made, indicate the mature (but not necessarily dry) bean of the Vilmorin's Stringless Bonavist, to be a delicate and highly appreciated side dish. These beans should be boiled for about five minutes with about a teaspoonful of bicarbonate of soda (in an earthenware or enamelled vessel, as an iron receptacle or traces of iron discolour them to a dark pink or blackish hue). The water is then strained off and the beans slightly washed—to cool them; they can then be readily and easily pulped, leaving the skin behind. The pulped portion (cotyledons) is then boiled with sufficient salt and black pepper till soft, and then served up lightly buttered. They have a slightly suggestive taste of split peas pudding, but much more nutty and delicate.

The green pod is coming into use locally as a side legume, and its cultivation for this purpose is being extended as its merits become more known.

---

5 Camphor Oil from the F.M.S. and Mauritius. *Bulletin of the Imperial Institute*, 1916, pp.577-85.

6 Camphor in the F.M.S. *Agricultural Bulletin*, F.M S., August 1909.

7 Camphor in Dominica. Report on Agricultural Department, 1918-19.

8 Camphor in St. Vincent, Report on Agricultural Department, 1918-19.

9 Insects injurious to Camphor. *Experiment Station Record*, Vol. XXXI p. 849; also Report on Florida Experiment Station, 1913.

10 Diseases of Camphor. *Agricultural Bulletin*, F.M.S., April 1911.

A copy has been received of the Imperial Education Conference held on June 11 and 12, 1919, at Australia House, Strand, London. Two of the many interesting subjects discussed were the interchangeability of credit for work done by students transferring from one University to another within the Empire ; and interchangeability of matriculation standards within the Empire. Attention was also given to the question of co-ordination of research and distribution of information as to the technical and commercial needs of the Empire. (This latter subject was ably dealt with by Sir Frank Heath, K.C.B., Secretary, Government Department of Scientific and Industrial Research.)

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

DOMINICA. Work in the Experiment Stations during the month of November was of a general routine character. The crop in the lime experiment station during the month of October was 303 barrels, and in November 325 barrels, making a total for eight months of 1,253 barrels of fruit. From the cacao experiment station, there were shipped to London 16 bags of cacao, also 2 bags of kola nuts and one barrel of nutmegs. Plant distribution during November comprised: limes 13 325; cacao, 350; vanilla, 100; budded citrus, 58; miscellaneous, 193. In addition, 234 packets of vegetable seeds were sold. In regard to staple crops, Mr. Joseph Jones, the Curator, states that the lime crop on the south leeward coast, which is the area of greatest production, reached its maximum during November, instead of as usual in July or August. He expresses the opinion that the lateness of the crop is due to the drought experienced during the first six months of the year. The local prices for ripe limes and their products remained unchanged. The cacao crop is reported to be promising. Scale insects are reported to be on the increase in several districts. Mr. A. Keys, the newly appointed Assistant Curator, arrived in Dominica on October 1. The weather during November was normal. The rainfall for October was 7·50 inches

NEVIS. Mr. W. I. Howell, Agricultural Instructor, writes to say that the crops at the Experiment Station had very much improved during the month of October, on account of the good rains, and that conditions at the station on the whole were better. Plant distribution from the station during the month included 20,370 sweet potato cuttings, 15 lb. onion seed, and 32lb. Paris green. The cane crop throughout the island made very rapid growth during the month in consequence of the fine rains. Preparation for next crop is in progress and a good acreage will be put under cultivation. The cotton crop also has taken on a very vigorous new growth, and a good second picking is anticipated: fields that were practically killed out by the dry weather are now looking green, and blossoming freely. Cotton worms attacked many of the fields, but they were poisoned, and not much damage was done. As usual there is a shortage of lime, and should there be a serious attack, is likely that a great deal of damage will be done. Leaf-blister mite is seen in many of the fields, and cotton stainers appeared in small numbers in a few places. The growers were advised to collect the stainers at once. A large acreage was planted in sweet potatoes and Indian corn during the month; the germination on the whole is good. The rainfall for the month was 8·61 inches; for the year to date, 26·18 inches.

Attached to the foregoing is a report of the Agricultural Instructor, Nevis, for the quarter ending September 30, 1919. From this it is gathered that the severe dry weather which continued during the whole of the quarter under review, did a great deal of harm to the crops at the experiment station. In regard to the demonstration plots, very poor returns are expected. The plots of selected cotton grew very badly, and the plants are making very poor progress. Cotton stainers made their appearance during the quarter but these were promptly collected in kerosene oil and water. The sugar-cane crop throughout the island is reported as poor. The crop is late, and has made very slow progress, with the possible result of no return, should the dry weather continue much longer. On account of the dry weather, practically no planting of provision crops was done during the quarter; the small acreage growing is in bad condition, and a great shortage is anticipated.

VIRGIN ISLANDS. According to notes forwarded by the acting Curator of the Experiment Station, Tortola, Mr. E. Maduro, for the months of September and October, 1,000 potato cuttings were distributed during September, and 33 ornamental plants in October. The general condition of things at the Experiment Station is said to be more satisfactory than in previous months. Progress can be seen, especially in the upkeep of the various plots. The coco-nut demonstration plots are looking remarkably well, and some of the trees are blossoming. No insect pest have been observed at the Experiment Station, nor have any been reported by the peasantry. The rainfull in September was 7·50 inches and in October 4·62 inches.

AGRICULTURE IN BARBADOS

The following is taken from the Barbados *Agricultural Reporter* for November 29, 1919.

The rainfall for November has been a very moderate one, and, with the exception of the downpour on the 10th referred to in our last report, there has been no rain of any thing like an inch since the fourth day of the month. In the centre of the island the total for the month is under 3 inches; in the south it is under 2½ inches; and, if the heavy rain on the 10th instant were excluded, the total in some of the hilly parishes would not be much in advance of that recorded in either the centre or south of the island. At the present time all the seaboards are very dry, and the situation on the St. Philip's coast would have been very trying but for the downpour of the 10th. This rain has materially improved the crops in this part of the island, and on a recent tour in this district we were surprised to find how fair was the promise of the plant canes.

In spite, however, of the new rainfall during this month vegetation has preserved its greenness, and one awaits with hope a favourable December. This is due to the satisfactory distribution of the showers which have fallen. The longest spell of showerless days was between the 4th and the 14th, and it was during the days immediately preceding the latter date that the hottest weather for the month was experienced. There was a change of temperate on the 15th instant, and since that date there have been spells of fairly cool weather with light but frequent showers. The showers on the 25th instant were followed by a mistiness which gave one the impression that the atmosphere was charged with millions of dust particles.

This is the third November in succession during which the rainfall has been below the average, and of the three, November 1917 was the most trying.

As far as the black soil is concerned, the tillage for the young crops is being rapidly pushed to completion, but there is still some draining and forking to be done. The fields in which tillage has been completed look well, and are very clean. On most red soil estates more labour could with advantage be employed. In this part of the island there is still a good deal of clearing up to be done, while in the

heavy lands of St. Joseph there are many acres as yet untilled. Of course in this area planting is, as a rule, deferred until a later date, although it would, we think, pay to plant the B. 6450 in these parts as early as anywhere else. This would, in all probability, relieve the congestion which takes place during the reaping season. Early reaping is often an advantage from many points of view.

Sheep manure is still being carted from Bridgetown in fairly large quantities for the fertilizing of the fields now being planted, and it would appear that this will continue for a few weeks to come. The supply of this manure is unequal to the demand.

The plants put in during October and the early part of November, chiefly the B. 6450, are growing well. The showers have been fairly seasonable, and planters are hoping for satisfactory results.

The other seedlings are now being planted, and in a short time the supplying of the first fields planted will have been begun. With the first supplying only one plant is usually put in each dead hole, but we learn that many planters, with the trouble of the last planting season fresh in memory, intend putting in two plants with the first supplying. We have even heard that an attorney in the north of the island has issued orders that planting be done with two cuttings in each hole. This, we think, is carrying anxiety to an extreme. We may assure ourselves of satisfactory germination where healthy cuttings are put in and where the land is in good heart, even if the rainfall be a moderate one. Last season's experience was exceptional.

There are two paragraphs in the last report on Sugar-Cane Experiments, published by the Government Department of Agriculture, which should prove of interest to planters just at this time when they are selecting plants for their fields. The one is on experiments with cuttings made from large and small canes. The other is on experiments with cuttings taken from plant canes, and from first and second ratoons. The experiments made with cuttings from large and small canes prove that the start made by the former is decidedly the better, and if the start be better, the race should also be in their favour.

The experiments with cuttings from plant canes and from first and second ratoons show that cuttings from first ratoons yield slightly better results than those from plant canes, but those from plant canes give a much higher yield per acre than those from second ratoons. We have heard of similar results having been obtained by Professor Harrison. Planters should therefore note that cuttings from second and third ratoons should not be made if they desire to get the best yield from their crops. Of course these experiments presuppose that as healthy plants are selected from the first ratoons as from the plant canes.

We would also refer to another paragraph in this report, which summarizes the results of the most recent experiments made with the best seedlings. The balance is distinctly in favour of the B.H. 10(12). This seedling yielded 4,100 lb. saccharose per acre more than the B.6450, and the Ba.6032 yielded. under similar conditions, 1,020 lb. saccharose per acre more than the B. 6450. It was also calculated in a subsequent paragraph of this report, that if the crop for 1919, taken as 55,000 acres, had been planted in the B H. 10(12), the yield on the basis of these experiments would have been 23,333 tons more of dark crystal sugar.

These figures are interesting, and planters would do well to think about them now that they are planting their crop for 1920. We know that results on the estate do not always place the B. H. 10(12) so high, while in some instances the B 6450 is considered the most satisfactory seedling; but there is a consensus of opinion as to the richness of the juice of the B.H. 10(12).

Everywhere the cotton crop has been viciously attacked by the worm. Where the plants were very young there will probably be a total loss, while the pods in the more advanced fields will yield only a moderate return. It would be a great boon if a treatment could be discovered which would make this plant immune from the attacks of its bitter enemy.

Potatoes are more plentiful than at the date of our last report. They are being generally sold at $1·20 per 100 lb, and in St.Lucy's parish they have been retailed at 10lb. for 10 cents.

WEATHER IN ANTIGUA.

The following report, under date of November 18, 1919, has been received from Mr. A. E. Collens, F.I.C., Acting Government Chemist and Superintendent of Agriculture for the Leeward Islands, relative to recent weather conditions in Antigua:—

I have to report that recently the island has been visited with a moderately heavy but continuous downpour of rain, for two days, and in some places 9 and 10 inches of rain have been measured. Sunday and Monday, the 9th and 10th instant, were wet days with light westerly breezes—and in the early evening continuous sheet lightning to the North. During the night showers were experienced, and the temperature dropped considerably—in the early morning 59°F. being the minimum temperature registered at the Botanic Station —while in many country houses 60 and 61°F. were reported at 6 a.m., and in St. Johns 63° and 64°F. being experienced at daybreak, and in many instances 68° F. being the temperature at midday. In this laboratory 70° F. was registered at noon of the 11th.

The following are the data for the rainfall and temperatures registered st 8 a.m each day at the Botanic Station :—

Date.	Rainfall.	Maximum temperature	Minimum temperature.
Nov. 10	0·55	86° F.	71° F.
Nov. 11	4·41	65° F.	59° F.
Nov. 12	2·70	74° F.	61° F.
Nov. 13	0·70	82° F.	65° F.
	8·36		

The 14th and 15th have been hot, steamy days with prevailing light N.W. to S.W. breezes, a sharp and prolonged shock of earthquake being experienced on the 14th instant at about 4·30 a m. (probably between 4·15 and 4·30 a.m.).

The Alliance Trading Co., Ltd., has informed this Office concerning a trial of the 'Revolt' Drain Excavator, which was arranged to take place in England on November 4, 1919. This excavator aroused considerable interest at the Royal Agricultural Society's show at Cardiff this year, and appears to be a useful labour-saving implement. Detailed information can be obtained from the Company's Offices, Holland House, Bury Street, London, E.C.

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co. on Sea Island cotton in the Southern States, for the week ended November 22, 1919, is as follows :—

ISLANDS. There has been only a moderate demand during the past fortnight for the limited offerings of the odd bags, classing Fine to Fully Fine on a basis of 85½c., f.o.b. and freight. However, the Factors are unwilling sellers on account of the high prices ruling for American stapled cotton, as well as on account of the small crop.

The planters' crop lots of Extra Fine and Full Extra Fine have not yet been put on the market for sale, the larger portion of them remaining on the plantations.

We quote, viz :—

Fine to Fully Fine @ 85½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. Since our last circular report of the 8th instant, there has been a good demand for the offerings, both in Savannah and throughout the interior markets, at advancing prices. The stock for sale consists largely of old crop cotton of 1917-18 and 1918-19, the United States Census Bureau reporting cotton ginned this season to November 14 as only 564 bales in Georgia, and 2,180 bales in Florida. The buying has been on account of the Northern Mills principally, although there has been some demand from Southern Mills, especially for the lower grades.

We quote for the past fortnight, viz :—

Average Extra Choice @ 83c. to 83½c., f.o.b. and freight, with Factors now unwilling sellers, except at several cents advance. The market closed very firm and held higher.

The exports from Savannah for the past fortnight have been, to Northern Mills 1,207 bales, to Southern Mills 720 bales, and from Jacksonville to Northern Mills, 1,331 bales.

The United States Census Bureau reports the amount of cotton ginned to November 14, as follows :—

South Carolina	1,482 bales	making a total of	4,226 bales	
Georgia	564 bales			
Florida	2,180 bales			
against last year,	20,319 bales.	Total crop	44,380 bales.	
„ 1917	68,188 bales.	„ „	88,174 bales.	
„ 1916	93 004 bales.	„ „	113,109 bales.	
„ 1915	69,447 bales.	„ „	85,278 bales.	

ORIGIN OF SEA ISLAND COTTON.

On page 326 of the current volume of the *Agricultural News*, some extracts from old letters on the subject of the origin of Sea Island cotton were given. In reference to the same subject, Mr. A. E. Collens, Acting Superintendent of Agriculture, Leeward Islands, forwards some other interesting extracts.

The President of the Virgin Islands, T. Price, in forwarding the Blue Book statistics for 1857, in his introduction states that :—

'Sea Island cotton which has obtained such celebrity in the English Market is supposed on tolerably good testimony to have been found indigenous in the island of Anguilla, whence it passed through intermediate culture in the Bahama Islands, into Georgia, where it now forms the staple export—proof sufficient of the capabilities of the Caribbean Islands to compete with the Sea Islands of the Southern States of America in its production so far as quality is concerned.'

The second extract is from a book entitled 'The Cotton Planters' Manual,' by J. A. Turner, published in New York also in 1857. In chapter iii of this book, p. 96, the following paragraph occurs :—

'The Sea Island cotton is the produce of a plant that seems to have been first carried to the Bahamas from the island of Anguilla, (whither it is believed to have been transported from Persia) and was sent to Georgia in 1786.' In chapter VIII, p. 278, under section I Brief History of Cotton—the following also occurs : 'The seed of the Sea Island cotton was originally obtained from the Bahama Islands, in about the year 1785 ; being the kind then known in the West Indies as the "Anguilla Cotton." It was first cultivated by Josiah Tatnall and Nicholas Turnbull, on Skidway Island, near Savannah, and subsequently by James Spaulding and Alexander Bisset, on St. Simon's Island, at the mouth of the Altamaha, and on Jekyl Island by Richard Leake. For many years after its introduction, it was confined to the more elevated parts of these islands, bathed by the saline atmosphere, and surrounded by the sea. Gradually, however, the cotton culture was extended to the lower grounds, and beyond the limits of the islands to the adjacent shores of the continent, into soils containing a mixture of clay ; and lastly into coarse clays deposited along the great rivers, where they meet the ocean tides.'

In section V—Statistics of Cotton—in tracing the history of cotton from 1730 to 1836, the following statement is made :—

'1789. Sea Island cotton first planted in the United States ; and upland cotton first cultivated for use and export about this time.'

Work of Agricultural Cadets in Grenada.—Reports have recently been received from Grenada on the work done by the cadets attached to the Agricultural Department in that colony. The work is of a practical character and includes the following :—

Testing the vitality of seeds.

Propagation by sowing seeds, by budding, grafting, layering and cuttings.

Pruning cacao, oranges, grape vine laterals, and root pruning citrus plants.

Compounding insecticides and fungicides.

Tillage operations : lining out plots for certain crops, drawing plans of plots to be cultivated, making calculations as to yield per given area, etc.

Cultivation of yams, cassava and onions.

Investigation of scale insects and of red ring disease of coco-nut palms.

Labour management.

Examination of samples of cotton.

Study of the working of cotton gins, and preparation of lint for market.

Cultivation of catch crops.

Mixing and applying chemical manures.

REPORT ON TWO WEST INDIAN SUGAR FACTORIES, 1919.

At the instance of the Directors of Gunthorpes Factory, Antigua, and Basseterre Factory, St. Kitts, the results of the working of these central factories for the past season have been furnished to the Imperial Commissioner of Agriculture for the West Indies. The following information extracted from these results will be of interest to those concerned with the manufacture of sugar in the West Indies and elsewhere.

In order to strengthen the interest of the figures, the corresponding results obtained in Java in 1918 are given, as far as possible, for purposes of comparison. These have been obtained from the *International Sugar Journal* for August 1919, p. 386.

Gunthorpes Factory crushed 90,186 tons of cane from which 9,739 tons of sugar were made. Basseterre Factory crushed 81 078 tons of cane giving 8,814 tons of sugar. This works out approximately at 9 tons of cane to the ton of sugar in the case of the Antigua and St. Kitts factories. During the previous season, namely 1918, the figures for Antigua and St. Kitts were, respectively, 8·8 tons and 8·5 tons of cane per ton of sugar.

The main features of the factories' work may be gathered from the following table:—

	Antigua.	St. Kitts	Java.
Canes crushed, tons	90,886	81,078	—
Juice diluted, tons	87,789	76,501	—
Juice undiluted, tons	65,539	62,131	—
Juice expressed per 100 cane	72·69	76·63	—
Juice expressed per 100 parts in cane. Or sucrose extracted per 100 parts of sucrose in cane	92·40	93·89	92·1
Sucrose in juice, tons	10,251	9,221	—
Commercial sugar made, tons	9,739	8,814	—
Purity diluted juice	83·06	84·00	86·5
Sucrose in 100 cane	12·30	12·11	13·63
Fibre in 100 cane	16·67	14·36	12·99
Sucrose in 100 megass	2·77	2·55	4·34
Juice in megass per 100 fibre	35·87	34·74	—
Juice lost per 100 cane	5·97	4·99	—
Recovery commercial sug r per 100 sucrose in juice	91·29	91·81	89·16
Commercial sugar made per 100 sucrose in cane	84·36	86·20	—
Sucrose in above per 100 sucrose in cane	84·42	86·25	82·61
Tons cane per ton commercial sugar	9·26	9,198	—
Polarization sugar made	96·07	96·05	—
Molasses Imperial gallons (approximately)	365,700	380,000	—
Molasses per ton of sugar	37·5	43·0	—
Filter cake, tons	1,400	893	—
Sucrose per 100 filter cake	4·88	5·41	4·36

Fibre Content of the Cane.

In regard to the fibre per cent. of cane, it should be pointed out that this figure, in the case of the Antigua and St. Kitts factories, is calculated by means of the formula

$$\text{Fibre in canes} = \frac{(100 - \text{crushing}) \times 100}{128 + \text{juice per 100 of fibre in megass.}}$$

referred to in the *West Indian Bulletin*, Vol. XVI, p. 96.

This formula is probably reasonably accurate, but to afford correct results, it is necessary that the crushing, or percentage of juice obtained from the canes shall be accurately known. At Antigua and St. Kitts the quantity of true juice is calculated from the diluted juice on the assumption that, while the purity of the juice obtained from the successive crushing of the train of multiple rollers falls off as one proceeds from one set of rollers to another, the total solids will not very appreciably diminish, the additional impurities extracted compensating to a large extent for the diminished sucrose, so that the quantity of true juice could be calculated from the diluted juice by assuming that this juice has the same specific gravity as the undiluted juice obtained from the first mill. This is perhaps somewhat near the truth when 6- or 8-roller mills are under consideration, but a new aspect of affairs is introduced when a train of fourteen rollers, exerting their utmost pressure is employed, as is the case at the factories referred to.

Recent investigation has led to the conclusion that the quantity of undiluted juice so calculated is too low, in the proportion of about 100:103. This underestimate of the amount of juice, that is to say, an underestimate of the crushing, introduces an inaccuracy in the use of the formula by which the fibre content of the cane has been calculated. It is open to us to introduce the correction by multiplying the crushing by the factor 1·03. This has been done, when the fibre in the canes at Antigua in the year under review works out at 15·17, instead of 16·67 per cent., and at St. Kitts 12·95 instead of 14·36 per cent.

In this connexion it is interesting to note that abnormally high fibre contents in the canes began to be reported in 1912, when the 14-roller mill at Gunthropes was first used with full efficiency; it was actually in operation in 1911, but the work done by it in that year was no more efficient than that of the 8-roller mill previously in use.*

The fibre contents of the cane of the crops from 1912 to 1919 inclusive, are shown in their corrected and uncorrected form, together with the uncorrected fibre contents for the earlier years.

	Uncorrected, as published.	Uncorrected up to 1912
1905	15·1	15 1
1906	15·2	15·2
1907	15·1	15·1
1908	15·2	15·2
1909	15·6	15·6
1910	15·9	15·9
1911	15.8	15·8
		Corrected for 14 -roller mills.
1912	17·5	16·4
1913	17·7	16·5
1914	16·6	15·3
1915	16·9	15.6
1916	16·2	14·9
1917	17·4	16·1
1918	16·1	14·7
1919	16 7	15·2

*Reviews of the work of the Antigua and St. Kitts central factories for the seasons 1918, 1917 and 1916 will be found in the *Agricultural News*, Vol. XVII, at p. 276, Vol. XVI at p. 356, and Vol XV, at p. 356, respectively. Other references to the work of these factories will be found in Vol. XVII, p. 151, Vol. XVI, pp. 83 and 197, and in Vol. XV, p. 67.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with the production of camphor, and draws attention to the several varieties of camphor trees occurring in different countries.

On page 391 will be found a review of the Report on two sugar factories in the Leeward Islands during 1919.

Under Plant Diseases, on page 398, will be found an article on the Red Ring disease of coco-nut trees.

An article on locusts in British Guiana appears under Insect Notes on page 394. There is also the first part of a summary of entomological information during 1918.

The Late John Charles Umney.

The *Perfumery and Essential Oil Record*, October 1919, records the death of Mr. John Charles Umney, Founder and Editor of that Journal. Mr. Umney may justly be considered as the leader of the British School of Essential Oil Chemists, a sound scientific, and able commercial man.

During the last twenty years he has taken a prominent position in public work. For instance, as Chairman he took an important part in negotiations with the inland revenue authorities concerning the law and regulations governing the industrial use of alcohol.

In January 1910 Mr. Umney founded the *Perfumery and Essential Oil Record*, a journal, which by diversity of essential oil and perfumery interests, took and retains a first place in the periodic literature of this class. Besides his contributions to the journal Mr. Umney produced much important pharmaceutical literature.

His keenness to extend aromatic and medicinal plant cultivation, especially within the Empire, in suitable climates, was very marked. In this connexion we desire to place on record that Mr. Umney was much interested in the development of essential oil industries, especially bay oil, in the West Indies.

His expert knowledge and advice were always at the disposal of the Imperial Department of Agriculture with regard to such questions, and were much valued. He rendered this Department much assistance from time to time, and his death causes a loss which is deplored, and which will be seriously felt by the Department.

Canada-West Indian Trade.

Mr. Frank H. Keefer, Parliamentary Under-Secretary of State for External Affairs, Canada, has furnished this Office with copies of diagrams showing the volume of trade between Canada and the West Indies, in regard to different products, for the year 1916.

The total volume of trade between Canada and the West Indies for the years 1918, 1917 and 1916 was published in the *Agricultural News* for September 20, 1919, at page 297. A notable feature has been the great increase in the exports from Canada to the West Indies, particularly to British Guiana, during 1917—18.

In regard to the diagrams referred to above, these show first of all that by far the greatest Canadian import from the West Indies was sugar and molasses, that country taking two-thirds of the total West Indian exports of this product. The next largest Canadian import from the West Indies was chicle gum, and after that cacao. The chief imports into the West Indies from Canada were breadstuffs and fish.

It is probable that these statements hold good approximately for the past year: it would be interesting to see graphs constructed for this more recent period.

War Materials as Fertilizers.

The Surplus Government Property Board has written from London to say that they are holding very large stocks of ammonium nitrate and cordite (which can be cheaply converted into calcium nitrate) if it were possible to use these substances as fertilizers. The enquiry is made as to whether they would be likely to prove suitable for sugar-cane, cacao, limes, cotton, etc., and it is stated that it could probably be arranged for these substances to be purchased by West Indian planters at a much lower figure than that which they are now paying per unit for ammonium sulphate and nitrate of soda.

Experiments have been made at Rothamsted in England, to ascertain the properties of ammonium nitrate as a fertilizer. According to Dr. Russell in the *Journal of the Board of Agriculture* (England) August 1919, p. 504, the material available before the war was too deliquescent for ordinary use. A much less deliquescent material is now available; it has been stored for months in the Rothamsted manure shed without giving trouble. Further, it can be drilled, like seed, with the utmost ease, either alone or mixed with superphosphate (though the mixture should not be stored). It gave good results on mangolds and potatoes, and as a top dressing to cereals. It is highly concentrated, containing 35 per cent. of nitrogen.

The second substance, calcium nitrate, has very similar manurial properties to sodium nitrate, though it cannot be so easily stored, owing to its deliquescent properties. It keeps well, however, in barrels that are more or less air-tight.

It is therefore easily seen that both of these substances could be profitably used as fertilizers in the West Indies, particularly for sugar-cane.

Root Nodules and Casuarina.

According to a note in *Botanical Abstracts* for February 1919, Casuarina has been successfully cultivated in Southern India on many of the wild waste lands. It thrives well on poor sandy soils, in many places growing luxuriously, and aiding greatly in preventing the spreading of dunes. So successful has this been that sandalwood trees can now be grown and cultivated on these dunes. Root nodules were found on *Casuarina glauca, C. stricta* and *C. quadrivalvis*, many of them large and branchy; though soft at first, they later become rather woody. Free cultures of bacteria from these nodules were made, and they were found to fix atmospheric nitrogen. An estimation of the liquid media, thirty-five days after the culture was made, showed an increase of 2·7 mg. of nitrogen per 100 c.c. of the liquid. It appears that, apart from the usefulness of Casuarina trees in binding loose, sandy soils, the trees exert a very beneficial influence by improving the soil to such an extent that facilities are afforded for the succession of the island flora.

The species of Casuarina occurring in the West Indies is *C. equisetifolia*, and in view of the above discovery, it would be interesting and important for the roots of the West Indian occurring species to be investigated.

Report of the Imperial Department for Scientific and Industural Research.

The 1918-19 Report of the above Department is to hand, and it may be regarded as one of the most important official publications of the British Government. It describes the steps that have been taken in regard to the investigation of all kinds of industrial problems in Great Britain, and deals also with the Department's efforts to encourage and support scientific research in the Dominions and self-governing Colonies. With this part of it the West Indies is closely concerned. The Department furnishes the funds for Mr. Harland's work on Sea Island Cotton in St. Vincent, and it has recently been decided to send a marine zoologist to the Bahamas to study the locally occurring sponges, with a view to developing the sponge industry there and in other parts of the West Indies. It is intended by the Department to place this worker in touch with the Imperial Commissioner of Agriculture.

An important feature of the Department's activities has been the organization of Research Associations in different industries, including those which are dependent on the tropics for their raw material.

Agricultural Re-organization in Trinidad.

At a recent meeting of the Board of Agriculture, Trinidad, Sir John Chancellor, K.C.M.G., Governor of the Colony, spoke on matters of re-organization in regard to the Department of Agriculture. The principal change will be the transfer of the functions of the Board to the new Department, to which Mr. W. G. Freeman has been permanently appointed as Director. The tax on produce, which at present finances the Board, will be gradually stopped. The result will be better centralization, and improvement in the position of the Board's present scientific officers, who will be placed on the permanent establishment.

The Governor also referred to the prospects of the Imperial Department of Agriculture transferring to Trinidad, and its amalgamation with the proposed agricultural college. On this subject no definite action has yet been decided upon, but the report of the Agricultural College Committee which has been sitting in London, has recently been laid before the Secretary of State for the Colonies, who nominated the committee, and the action to be taken as a result of the committee's recommendations should be made known at an early date.

Momordica cochinchinensis.

Reference to this attractive cucurbitaceous plant was made in the *Agricultural News* for February 22, 1919, and for November 1, 1919. The plant is a very handsome one, both as regards its flowers and fruit, and is well worth growing as an ornamental. As regards its economic value, it is believed that the seeds contain an oil which is valuable on account of its drying properties. Mr. J. Jones, Curator of the Botanic Gardens, Dominica, has recently written to say that he has dissected a fruit weighing 3¾lb., containing forty-two seeds, weighing 6 oz.

INSECT NOTES.

LOCUSTS IN BRITISH GUIANA.

British Guiana was invaded in 1917 by an enormous swarm of migratory locusts, which, originating in Venezuela at or near the mouths of the river Orinoco, spread over the entire coastal region of the north-west territory as far as the Essequibo River which formed the eastern limit of the migration. A similar invasion occurred in 1886 which extended as far as Berbice. An account of the invasion and of the life-history of the insect appeared in the *Bulletin of Entomological Research* for July 1919 (Vol. IX, p. 341) by G. E. Bodkin, B.A., (Cantab.), Department of Agriculture, F.Z.S, F.E.S., Government Economic Biologist, and L. D. Cleare, Jnr., F.E.S., Biological Division Department Science and Agriculture. These notes form a brief review of this article.

The invasion was reported in July 1917, and by that time the locusts were well distributed. It is believed that the swarm arrived in British Guiana during June. Cassava and maize were the favourite food-plants of the locusts, and inmany places cassava was entirely defoliated, and the corn was destroyed. Other plants suffered from the attacks of these insects, but to a much smaller extent.

The insect concerned in this invasion was probably the same as that identified as *Schistocerca paranensis*, Burm., which invaded Trinidad a few years ago. There seems to be a great deal of confusion in regard to the name however. The species is variable, and slightly differing forms have been described under different names. The insect is similar in appearance to the common West Indian grasshopper (*S. pallens*, Thunb.).

After an inspection to determine the extent of the invaded territory and the seriousness of the attack on crops and other plants, an active campaign was started for the control of the locusts. This campaign, which was considered to have been eminently successful, was conducted over an area of 250 square miles, at a cost of $2,038·60 (£424 14*s.* 2*d.*).

Of all the methods tried the use of poisons was the least effective. Other me hods were the destruction of the eggs, burning, driving into trenches, and the use of molasses and tar.

With a little experience the spots which are attractive to the adult females for egg-laying can be located, and by searching the soil in these localities enormous numbers of egg-masses can be collected.

In the drier districts very satisfactory results were obtained by burning, The swarms of hoppers were located in the bush, fire started all round, and the swarm destroyed.

In cultivated areas the hoppers were driven into a mass of day bush and the bush then fired. The driving of the swarms into trenches proved a simple and efficacious method. As the hoppers arrived in the water in the trenches, kerosene was thrown in, and the film of oil on the surface of the water hastened the death of the insects.

Tar or molasses smeared on tarpaulins, sheets, palm leaves, banana leaves, flat pieces of tin or other flat surfaces were efficacious in catching large numbers of insects. The smeared materials were spread under clusters of hoppers on the foliage of plants, and they were shaken off, or the swarm was surrounded by these things, and the hoppers driven on to them

Practically all the control work was directed to the destruction of the hoppers or immature insects. The adults are more difficult to deal with, as they can fly, and egg-laying had begun before the control campaign was organized.

It was found necessary to enforce the provision of the Insect Pest and Plant Diseases (Prevention) Ordinance of 1914, in order to get certain of the farmers to undertake the work of fighting the locusts. When a few examples had been made, no further difficulties of this sort arose. This was the first occasion on which this law had been enforced for the control of an insect pest.

LIFE-HISTORY.

Suitable spots are chosen for egg-laying, and here enormous numbers of adult females congregate. The eggs are mostly deposited in the cooler hours of the afternoon. The female forces her abdomen into the soil tunnelling a small excavation by means of the horny processes on the tip of the abdomen. The eggs are voided into the excavation, embedded in and surrounded by a mass of frothy substance, which hardens and becomes somewhat brittle. Each egg-mass contains fifty to sixty eggs which are found at a depth of about 2 ½ inches. The egg stage occupies a period of two to three weeks. The newly hatched larvae are a light pea-green in colour, with dull black markings, and they are covered with fine, light-coloured hairs. The antennae are black, the base of each segment is yellow, there is a black meso-dorsal line, and the hind femora show three broad black bands

The first nymphal stage lasts eight days. At the end of eight days the skin is shed, and then the general colouration is much darker, being black with light markings. This stage occupies seven to eight days. In the third nymphal stage the general appearance is similar to that of the second. This period extends from ten to thirteen days.

The fourth stage lasts also ten to thirteen days, and the appearance of the young hopper is much as in the third. The wing pads which were first to be seen in the previous stage are now more conspicuous.

The fifth and sixth nymphal stages are marked by the increasing size of the wing pads, and the developing intensity of the colour markings. These stages occupy from nine to eleven, and from fourteen to sixteen days, respectively, making a total length of the cycle from oviposition to maturity of the insect of from sixty-four to eighty days. The length of time from the change into the adult form to the deposition of the eggs is not given, but it would probably add not more than a few days to the figures already stated.

SUMMARY OF ENTOMOLOGICAL INFORMATION DURING 1919.

For several years past it has been customary to issue a summary of the information relating to entomological subjects which has appeared in the publications of the Imperial Department of Agriculture. This summary has usually been published in the *Agricultural News* in the last number or the last two numbers for the year.

During the year 1919, Insect Notes have appeared in the accustomed place in every number of the *Agricultural News*. The reports on the Department of Agriculture in the several islands have contained interesting entomological notes, but as the information contained in these notes has appeared in another place (Report on the Prevalence of some pests and diseases in the West Indies during 1917, *West Indian Bulletin*, Vol. XVII, Part 2 p. 83) they will not be reviewed here.

No numbers of the Pamphlet Series have been issued during 1919. Only one paper on an entomological subject has appeared in the *West Indian Bulletin* during the year, that by H. A. Ballou, M.Sc., on cotton and the pink bollworm in Egypt, which is contained in the last number of Volume XVII. A paper in the *West Indian Bulletin* (Vol. XVII, p. 162) by S. C. Harland, B. Sc., on the inheritance of immunity to leaf-blister mite (*Eriophyes gossypii*) in cotton, has a bearing on an entomological aspect, since it is shown that plant strains can be bred immune to the attacks of leaf-blister mite, and therefore that there is a possibility that attacks of this pest may be obviated by the production of immune varieties or strains of cotton. The number of the *West Indian Bulletin* containing these two papers was reviewed on page 376 of the last issue of the *Agricultural News*.

The Insect Notes dealing with sugar-cane pests consisted of an article at page 218, 'Sugar-cane and Hard Back Grubs in Antigua.' The Information contained in this article was taken from a report of the Entomologist on the staff of the Imperial Department of Agriculture after a visit to Antigua. An interesting series of articles on an investigation of the froghopper pest and disease of sugar-cane appeared in the columns devoted to Plant Diseases. They comprise the report of the Mycologist after a visit to Trinidad to study the relationship existing between the serious outbreaks of froghoppers in the sugar-cane fields in that colony, and the fungoid diseases of that crop. These articles are four in number, and they are to be found at pages 174, 190, 206 and 222.

Cotton insects are referred to in an article on the chinch bug fungus at page 154, where an account is given of this fungus attacking cotton stainers in Antigua; notes on the relation of certain wild food-plants to the abundance of stainers are given on pages 155 and 278, and on page 5 a note is given on the value of honey bees in the pollination of cotton blossoms. The destruction of the food-plants of the cotton stainers in Montserrat forms the subject of a short note on page 153.

Insects attacking citrus trees are referred to in an article on page 11, where a new pest (*Clytus devastator*) of the orange in Florida is mentioned. Cacao thrips in Grenada is the subject of the Insect Notes on page 122. The spread of the Mexican boll-weevil in the cotton-growing districts of the United States is discussed on page 234, and a note to the effect that the pink bollworm appeared to have been eradicated in those districts in Texas to which it was accidentally introduced was given on page 187.

An article on the control of the onion thrips (p 314) recommends the use of nicotine sulphate, soap and water, as a spray. This has given good results in the United States.

The protection of stored grains against insect attack forms the subject of several articles. The protection of Indian corn against weevil, is discussed on page 314, and the nature of the attacks of the pea and bean weevils, and the control of these pests by fumigation and carbon bisulphide, treatment of the seed by heat, and protection by the use of naphthaline in the sacks in which the grain is stored, are discussed at pages 266 and 282, while another article (p. 303) records the successful employment of air-slaked lime as a protection against cowpea weevil.

On page 202 an interesting account is given of the means adopted in Australia to protect the wheat stored and awaiting shipment in 1918 from the attacks of weevils. Attention to the proper construction of the stacks, and the use of naphthaline on the ground where the weevil had been breeding in scattered grain served to protect from renewed attack, and the application of heat, and a machine for removing the weevils and dirt, checked the attacks which had already begun, and cleaned the grain and rendered it suitable for human consumption.

A report on entomology in Jamaica was reviewed at pages 10 and 26, where a large number of insects is mentioned, and remedial measures for many of them discussed.

(*To be continued.*)

WASTE IN MOVEMENT STOPPED.

The Times draws attention to an interesting experiment in reducing effort, and at the same time increasing output, which was undertaken recently at the Derwent Iron Foundry, Derby, and is described by Dr. Myers in a report to the Industrial Fatigue Board.

In May 1915, the iron foundry began to work for the Ministry of Munitions. Its estimated capacity for the articles produced was 3,000 weekly. Mr. Jobson, the managing director, began in August 1915 to apply new methods, and these were so successful, that by August 1918 the output was 20,000. During the period August 1916-18, the value of output increased fivefold, though the price paid by the Ministry had been reduced meanwhile by 13·3 per cent.

The methods employed to obtain this startling success were as follows: Mr. Jobson approached his employees with the statement, 'We are out for higher wages, less hours, and more output. Will you help us? Are you willing to have your movements studied so that we can find the best way, adopt this as standard, and cut out useless and unproductive movements?'

The study of movements, and the training based on that study, were then begun. The movements were examined in various directions.

1. Various jobs were analysed to their elemental units, and each action was followed with a stop-watch in order to arrive at the best and quickest method of performing it.

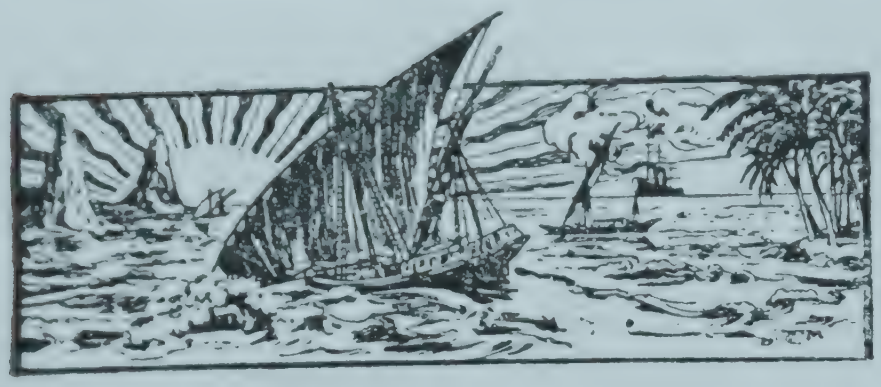
2. Tools and materials were arranged in a standard manner, and thus all unnecessary movements to obtain these were eliminated.

3. A standard set of movements for each process was established, with a standard time for the employment of each.

4. Such movements as could be performed simultaneously were combined.

During training, typewritten instructions in each movement, with times necessary for its accomplishment, were given to each student. The number of elements standardised in the process of moulding alone ran into hundreds. Men were trained individually rather than in groups. As soon as training was begun the hours of work were reduced from fifty-four to forty-eight per week. Instead of starting at 6.30 a.m., the employees started at 8 a.m., and worked till 5·45 p.m., with an hour's interval.

It was argued that a man who produced a greater number of pieces is entitled to a higher price per piece, and so a method of differential piece-work pay was introduced. As soon as a man's output reached 60 per cent. of the standard he began to receive a bonus. By this system one man increased his earnings 200 per cent. over the sum received before the new methods were introduced. In addition to the great increase of output, the system was found to be less tiring. An employee described it as 'best for yourself as well as best for the boss.' (*Journal of the Royal Society of Arts* for October 24, 1919.)



GLEANINGS.

According to the September report of the Department of Land Records, the estimated area under cotton in Assam (1919-20 crop) is 33,000 acres. The prospects of the crop continue to be fair.

A note on Aleurites oil appears in *L'Agronomie Coloniale* for July-August 1919. This oil, which is obtained from the nut, has a purgative action, which, however, is not as violent as that of the residual oil cake, showing that the purgative principle tends to remain behind during the crushing of the nuts.

According to *Nature* for October 23, 1919, the following research associations have been formed by the British Department of Scientific and Industrial Research: British Rubber and Tyre Manufacturers Research Association, and the Linen Industry Research Association.

The Annual Report for 1918 on the Forest Administration of Nigeria shows the number of forest reserves to be gradually increasing. Their total area now amounts approximately to 1,462 square miles in the Southern Provinces, and to 3,965 square miles in the Northern Provinces.

According to a note in the *Experiment Station Record*, Vol. XL, No. 9, a tea can be made from avocado leaves thoroughly dried in the shade, the test reported being made with leaves of the Northrup avocado. The infusion was made in the usual way, using 25 grains of the dried leaves to a quart of water, and allowing it to stand for five minutes.

There is no change in the area under sugar-cane (32,500 acres) reported in the previous forecast to the September one issued by the Department of Land Records and Agriculture, Assam. The shortage of rain in August retarded to some extent the growth of this (1919-20) crop, but the rainfall in September was seasonable, and a fair outturn was estimated.

The possibility of producing orange vinegar instead of the apple product in citrus regions is mentioned in the *Experiment Station Record* for June 1919. Reference is made to a process for the manufacture of orange vinegar in barrel quantities which is said to produce vinegars equal to the best grades of cider vinegar.

An interesting note on the chemical composition of *Agave americana* appears in the *Experiment Station Record* for June 1919. Amongst other matters referred to, the possibility is suggested of extracting the juice of the leaves and evaporating it in vacuo, the resulting product being a sweet, slightly acid marmalade suitable for human consumption.

In discussing building up the cotton industry in South Africa, the *South African Sugar Journal* calls growers' attention to the importance of community production. In doing this, reference is made to the recognition of this principle in the West Indies and in the United States of America. It appears that cotton production is making good progress in certain parts of South Africa.

A striking instance of the value of adding potash to a soil deficient in this ingredient appears in the Report of the Woburn Experimental Station of the Royal Agricultural Society of England for 1918. Clover, a leguminous crop, which would scarcely grow on the soil, was, by the application of potash manure, caused to thrive, whether sown alone or in conjunction with rye grass.

According to a communication from the British Empire Sugar Research Association, it appears that this body is a strong one, and that the members elected to the Council represent most branches of the sugar industry throughout the Empire. The President of the Association is Sir George Beilby, who is a member of the Advisory Council of the Government Department of Industrial and Scientific Research.

The value of the Searby Shredder in cane crushing is referred to in the *International Sugar Journal* for October 1919. The shredder is a drum with beaters fixed, revolving in a casing at a speed of about 300 revolutions per minute. It is placed between the crusher and the first mill. On a sugar estate in Hawaii, the system is in use in front of a train of four 3 roller mills, and with about 57 per cent. maceration, the installation is making an extraction of 99·25 per cent. of the juice in the cane.

As the result of the strike of pressmen in New York, the issue of the *India Rubber World* of November 1, 1919, has been delayed. In its place, an emergency bulletin containing market reviews and quotations has been issued to preserve continuity. This bulletin is in the nature of a supplement to be inserted in the usual publication, which will appear as soon as the controversy has been settled. It may be pointed out that nearly 200 leading New York publications have been similarly affected by this strike.

In the *Financier* (London) for November 3, 1919, there is an instructive report of an interview with the Imperial Commissioner of Agriculture, on the subject of the present outlook in the West Indies. Sir Francis Watts said it was pleasant to be able to report a state of prosperity in nearly every colony, where formerly one heard a tale of misery and of general decadence. Details are given as to the present position of the sugar-cane, cacao, cotton, and lime industries, and the report generally gives a true account of the present position in regard to West Indian agriculture.

THE SEASIDE GRAPE TREE.

An interesting and well illustrated article on this well known tropical American tree was contributed to the August number of the *Cuba Review* by Mr. C. H. Pearson, which is reproduced below:—

Sea grape is the usual name given to an interesting tropical American tree that is botanically known as *Coccoloba uvifera*. The generic name Coccoloba comes from two Latin words, *coccus*, meaning berry, and *loba*, a lobe, having reference to the peculiarity of the calyx lobes of the flower which surrounds the ripe fruit The specific term *uvifera* is from the Latin *uva*, grape and *fero* to bear, meaning grape-bearing. The fruits occur in clusters of pear-shaped purple berries about the size of small grapes. It is for this reason that the tree is variously known as grape, mangrove grape, wild grape, sea grape, seaside grape, seaside plum, round leaved seaside plum, and pigeon wood tree. It is less often referred to as the American, Jamaican, and West Indian kino tree. The following Spanish names of this tree likewise have reference to the peculiar character of the fruit: uva caleta, uva mar, uvero, and uverillo.

The names listed indicate clearly that the tree is largely confined in its range of growth to the seacoast. The name mangrove grape infers that the tree grows among the mangrove trees, which do not thrive beyond the limits of high tide. In fact, next to the mangrove it is said to be the commonest tree on the shores of Cuba, as well as in other parts of the West Indies. The sea grape is very common in southern Florida from Cape Canavoral southward. It is found on all the West Indian islands and on the tropical parts of the Spanish Main. The tree is not wholly confined to sea-shore, but in Cuba and Jamaica, where it finds its best development, it grows in the moist woods of the interior at elevations of 500 feet or more. Very little is known in reference to the distribution of the sea grape in South America. The shores of the Caribbean Sea afford the most congenial conditions for the growth.

In a range so large, and including situations so various, it is natural that the tree should vary greatly in size. Generally speaking, the sea grape is only a low shrub in many parts of the west coast of Florida It rarely grows to be more than 20 feet in height and 1 foot in diameter. In poor seaside sand the trees remain small and bushy, while in good soil, and protected from the strong ocean winds they often attain a height of from 25 to 60 feet, and from 18 to 24 inches or more in diameter. There is perhaps no tree in the tropics better distinguished from others, even by those who possess but little knowledge on the subject, than the sea grape. The young branches are smooth and gray, but the older ones and the trunks have a rough bark full of fissures. The leaves are remarkable for their large size; they are nearly round, with a narrow cleft at the base, where they are attached to very short leaf-stalks, which single it out from most other trees. According to Oviedo, the Spaniards used the wide leaves of this tree to write on with the point of a bodkin. They are sometimes covered with a slight gummy exudation that has an astringent taste similar to the extract of kino. The berries, which are eaten like grapes, have a refreshing, agreeable, subacid taste.

As a timber-yielding tree, it holds a far more prominent rank than is generally supposed. In Cuba, Jamaica and Porto Rico it furnishes an economic wood of considerable local importance. It has been described as being hard, heavy, strong, tough, and durable in contact with the soil. It is dark brown, tinged with red, or sometimes slightly violet-coloured. Upon boiling the wood in water or in dilute alkaline solution, it imparts a ruby-red colour to the water. The wood possesses many valuable properties, and when it occurs in large sizes it is deemed among the finest woods for many important uses. In Cuba and Jamaica it is employed extensively for making expensive cabinet work and fine furniture. Although it is hard and compact, it works with considerable ease, and has a very fine grain and is susceptible of a good polish. The pores are very small and evenly distributed throughout the annual rings of growth, which are scarcely visible to the unaided eye.

The timber and the fruit of this tree do not constitute the only products it yields. An astringent resinous substance or concrete juice, called West Indian kino in the trade, is obtained from this interesting tree. While it is at present of comparatively little commercial importance outside of the region of its production, it is, nevertheless, frequently the subject of inquiries, and, as the information published regarding it is somewhat scanty, it may be useful to record briefly a few of the more important facts relative to this little-known product, the methods of obtaining it, and its uses.

The so-called West Indian kino is variously known also as gum kino, American kino, American extract of rhatany or false rhatany extract. Kino is a comprehensive trade name applied to a number of astringent resinous substances obtained either by tapping the trunks or by extracting it from various parts of the tree. The tapping is accomplished by making a V shaped incision in the bark. The exuding material is usually led into a container at or near the base of the tree For this purpose an open, perpendicular channel is cut, connecting the bases of the V-shaped incisions. The product may be extracted from the wood, bark and leaves by boiling and evaporating it down. The residue is at first thin and red, but it rapidly becomes thick, and dark brown. It is a brittle product that may be easily reduced to a powder of a rich ruby-red colour. In the market it occurs most commonly in grains of a shining aspect.

At one time there was a small trade in this West Indian product. It was first collected and exported from Jamaica and several islands of the West Indies. In recent years the demand for kino has been supplied by West Africa and parts of the East Indies, but there is no reason why this West Indian product is not more generally collected and put to some economic use. There is at present only a limited use of kino in medicine, but it may be employed also as an astringent, and for tanning leather, and for dyeing cotton.

DEPARTMENT NEWS.

Mr. W. R. Dunlop, Scientific Assistant, Imperial Department of Agriculture, left Barbados by the R.M.S. 'Chignecto' on December 11, 1919, on an official visit to St. Vincent. Mr. Dunlop is expect to return to Barbados on December 23.

As a result of work on pollination of tomatoes, A.G.B. Bouquet, Oregon, states that hand pollination of flowers has reduced the number of unfruitful blossoms from 66 per cent. to 20 per cent. of the total number of flowers produced, the percentage of reduction depending upon the comparative thoroughness of the pollination. (*Experiment Station Record*, September 5, 1919.)

PLANT DISEASES.

RED RING DISEASE OF COCO-NUTS.

The following is a report read by Mr. W. Nowell, D.I.C., Mycologist, Imperial Department of Agriculture, before a meeting of the Board of Agriculture, Trinidad, on October 16, 1919, on the subject of the Red Ring Disease of Coco-nuts:—

I may perhaps appropriately take this opportunity of putting forward a brief communication on a subject which to coco nut planters is of no less importance than is frog-hopper blight to cane growers.

It may be remembered that during my last visit I had incidental opportunities of making observations on the so-called root disease of coco-nuts, and announced the invariable association of the disease, in all cases examined, with a minute thread worm or nematode. The matter was not then sufficiently advanced for the issue of a report, and the investigation is still far from complete. I had an opportunity of making some further progress with it in Grenada last February, and during my absence on leave, some experiments then begun have been completed and supplemented by Mr. J. C. Moore, the Superintendent of Agriculture in that island.

An illustrated account of the disease was prepared early in the year for the *West Indian Bulletin*, but owing to various delays has not yet appeared. It will now be out of date in so far that some of the deductions made as to the development and progress of the infestation do not agree with the facts recently learned, but, as a description of the disease, it remains, so far as I know, quite accurate.

As this account will shortly be available, I propose to give now only such general outline of present knowledge on the subject as is appropriate to a business meeting.

In the first place it must be stated that the connexion of the disease with the nematode worm has been abundantly confirmed. Not only is the worm present in close association with the first appearance of the disease in any organ of the plant, but infection experiments, with material to all appearances pure have resulted in complete and typical infestation of the inoculated trees with the reproduction of all the symptoms of the disease, the parallel controls remaining healthy. The proof cannot be considered absolute, but it comes nearer to certainty than is the case with very many plant diseases in which causation is regarded as established.

The worm has been described as a new species* by Dr. N. A. Cobb, of the United States Department of Agriculture, who has prepared a paper on its characteristics for the forthcoming number of the *West Indian Bulletin.*

It is now clear that the existence of the disease in the roots, though fairly general, is only secondary. Examples have been seen in which the roots were affected only in the slightest degree. The centre of infestation is the red zone in the stem, which is simply a vast breeding ground of the worm. From this it extends more or less along the roots, and, what is much more serious in immediate results, to the leaves This includes not only the mature and semi-mature leaves which progressively fail in the familiar manner, but the very youngest rudimentary leaves, only a few inches long, in the centre of the bud. It appears to be this infestation of the leaves which brings about the death of the tree.

In plantations where the trees are uniform in age. the disease typically appears first in widely and thinly scattered cases when the trees approach bearing age. This can occur equally on virgin forest soil or on old cultivated land. The worms may come from some unknown alternative host, not coco nut, but the balance of probability seems at present to be with the conclusion that they are introduced with the seed nuts.

From the centres of infection thus established, the disease extends to surrounding trees, and the resulting losses can be very serious. I have already seen or heard of several instances in which they approached 30 per cent.

The process of natural infection, and the length of time required for development remain to be investigated. Three trees in Grenada inoculated in the stem 1 to 2 feet from the ground were fully infested and failing in sixty days A tree inoculated in the stalk of a leaf had a rather general but not fully developed infestation in seventy-four days. A tree in which material was placed among the leaf bases without inoculation was fully infested in stem and leaves in seventy-four days, while a tree similarly treated in one leaf base had seventeen infested leaves at the end of the same period.

It thus appears that infestation may take place among the leaves without previous injury, and this can be conceived as quite possibly occurring from dry infected material blowing about, or from worms gaining access to the leaf bases of young trees from the soil.

There is a large amount of detail work remaining to be done with regard to the resistance of the worms to dryness and to chemical agents, to their distribution and longevity in the soil, and other matters. This work is of an obvious kind, and, given the opportunity, there is every prospect of approaching to a fairly complete knowledge of the disease within a reasonably short time.

It is clear that the only hope of control lies in prevention and not cure, and the biggest practical difficulty is going to be the disposition of the vast amount of infested material which the dying trees contain.

**Aphelenchus cocophila.*

A paper on the distribution of dry matter and nitrogen in the potato tuber appears in the *Journal of Agricultural Science* for September 1919. The percentage of dry matter in the potato tuber is lowest in the skin, and increases to the inner corticel layer and decreases towards the centre of the tuber. The nitrogen percentage increases from zone to zone in the opposite direction to the dry matter, but it tends to increase with dry matter from the terminal to the umbilical end at which the tuber is attached to the plant. These results refer to the English potato.

In the Antigua *Sun* for November 13, 1919, there is a report of the proceedings of a general meeting of the Antigua Agricultural and Commercial Society, at which Mr. T. Jackson, formerly Agricultural Superintendent, was presented with an address and honorarium in respect of his services to the society. The Chairman, Mr. R Bryson, in the course of his address, said it was his pleasant duty, on the eve of Mr. Jackson's departure for St. Vincent, to thank him especially for his valuable work as Honorary Secretary of all the co-operative associations connected with the Society.

RATS AND THEIR EXTERMINATION.

More and more attention is being directed to the extermination of rats, animals which, though of Asiatic origin, have spread all over the world, and, linking their fortunes with those of humanity, have developed into serious pests, taking a heavy toll from human prosperity, and forming a deadly menace to the public health.

As one of its Economic Series (No. 8) the British Museum (Natural History) has issued an important pamphlet giving a brief account of these various animals, their habits and breeding. This pamphlet also deals with their economic importance, and their relations to the public health, and suggests measures by which they can be controlled, if not exterminated.

The principal suggestion is that a country should be divided into districts, each having, as far as possible, water for its boundaries. Work in each district should commence at the boundaries and proceed gradually towards the centre. Systematic operations—poisoning, fumigation of burrows, trapping, etc.—should be carried out not only by paid officers, but also by every individual householder.

This intensive system of attack is now a recognized leading principle in public hygiene, and is the only way to effect the extermination of pests and diseases in relation to man.

As regards methods of rat destruction, some important results are shortly to be issued in detail by the Zoological Society of London. The subject has recently been investigated for the Society by Mr. E. G. Boulenger, and in *Nature* for October 2, 1919, reference is made, as follows, to some of the results obtained.

Where rats were present in large numbers, and where it was not practicable to use gas, poisioning was found to be the best and cheapest method to adopt for their destruction. Of all the poisons experimented with, squill, the extract of the bulb of the Mediterranean plant, *Scilla maritima*, gave the greatest satisfaction. Good result were also obtained with barium carbonate. Both these poisons, Mr. Boulenger said, were, in the small quantities required to kill rats and mice, more or less harmless to domestic animals. The destructive power of virus was found to be more untrustworthy than that of some poisons. The most successful form of trap consists of a tunnel-shaped cage with open doors at each end, which shut when the rat treads on a platform in the centre of the passage. The common steel-gin-trap was specially successful when covered with wire tunnels. A large number of experiments was conducted in order to ascertain whether there was any truth in the statement that rats are influenced by human odour. As a result of these experiments, it was found that it was superfluous to avoid handling traps on the assumption that rats are detracted by the odour of men. Sulphur dioxide was found to be the most effective gas, and was recommended for killing rats on ships and in confined spaces. When driven off under pressure, the gas could be used with success in fumigating rat holes in the open.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of October :—

The recent strike of the railway men throughout the Kingdom, though it was of comparatively short duration, was sufficiently long to disorganize trade and commerce generally. In the Produce Markets its effect was severely felt. Many of the auctions that had been previously fixed had to be postponed at the last minute, added to which there was the uncertainty whether the transport workers would remain at their duties. In the abnormal condition in which the markets are at the time of writing, the question of prices paid for many of the products referred to in these notes, must not be taken as a standard price. The following are some of the principal items of West Indian production.

GINGER, NUTMEGS, MACE, PIMENTO AND ARROWROOT.

At auction on the 16th of the month Jamaica ginger was in slow demand at from 85*s.* to 90*s.*, at which rate African and Japanese were quoted. Good sound Cochin was reported scarce at 100*s.* to 105*s* At the same auction 17 packages of nutmegs were also offered and sold at the following rates: 92's to 80's, 1*s.* 8*d.* to 1*s* 10*d.*; 99's to 76's, slightly wormy, 1*s.* 6*d.* to 1*s.* 11*d.*; 110's to 108's, also slightly wormy, 1*s.* 5*d.* to 1*s.* 9*d.*; while 130's sound were quoted at 1*s.* 6*d*, Mace was also in fair supply at the same sale, 17 packages of West Indian being offered, fine pale fetching 2*s.* 1*d.* to 2*s.* 2*d.*, good 1*s.* 9*d.* to 1*s.* 10*d*, and fair 1*s.* 8*d.* There has been a steady market in pimento throughout the month at $5\frac{1}{2}d.$ per lb. At auction on the 16th of the month 50 barrels of St. Vincent arrowroot were offered and 25 sold at $5\frac{3}{4}d.$ per lb.

SARSAPARILLA.

At auction on the 23rd of the month sarsaparilla was represented by 26 packages of grey Jamaica, only 10 of which found buyers; 2*s.* 9*d.* per lb. was the price wanted; 3 bales of red native Jamaica were disposed of at 1*s.* 6*d.* per lb.; some 16 serons of Honduras were sold at from 4*s.* to 4*s.* 3*d.*

CITRIC ACID, LIME JUICE, KOLA, TAMARINDS, AND CASSIA FISTULA.

Citric acid has been slightly cheaper at 4*s.* 3*d.* per lb. West Indian lime juice and lime oil have been in good supply, good raw juice selling at 2*s.* 9*d.* to 3*s.* per gallon. Kola has also been in good supply. At auction on the 16th of the month good sound West Indian was sold at 7*d.* to $7\frac{1}{2}d.$ per lb. Again on the 23rd, 160 packages were offered but only 82 found buyers At the end of the month some 60 odd barrels of West Indian tamarinds, described as 'ordinary stoney', were limited at 47*s.* 6*d.* It is reported that Cassia Fistula pods have been selling at from 160*s.* to 170*s.* per cwt., and holders are now asking 200*s.*

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, October 16.

BALATA—Venezuelan Block, no quotations; West Indian Sheet, no quotations.
BEESWAX—No quotations.
CACAO—Trinidad, 125*s.* to 126*s.*; Grenada, 118*s.* to 126*s.*; Jamaica, St. Lucia, St. Vincent, and Dominica, no quotations.
COPRA—£55
HONEY—Jamaica, 72*s.* 6*d.* to 90*s.*
LIME JUICE—Raw, 2*s.* 3*d.* and 2*s.* 6*d*; Concentrated, no quotations.
PIMENTO—5½*d.*
RUBBER—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

Barbados—Messrs. T. S. GARRAWAY & Co., December 9.

ARROWROOT—$9·00 per 100 lb.
CACAO—$20·00 per 100 lb.
COCO-NUTS—$45·00 husked nuts.
HAY—$4·50 to $4·75 per 100 lb.
ONIONS—$16·00.
PEAS, SPLIT—No quotations; Canada, Market bare.
POTATOES—$4·25 per barrel
SUGAR—Market bare.

London.—THE PERFUMERY AND ESSENTIAL OIL RECORD, October 21, 1919.

BAY OIL—16*s.* to 18*s.*
LIME OIL—Flat, at 3*s.* 9*d.* to 4*s.* for West Indian distilled, and 11*s.* for hand-pressed.
ORANGE OIL—West Indian sweet, 8*s.* 6*d.* to 9*s.*; bitter, 9*s.* to 10*s.*

Trinidad.—Messrs. GORDON, GRANT & Co., November 5

CACAO—Venezuelan, $26·00; Trinidad, $25·00 to $26·00.
COCO-NUT OIL—$1·65 per gallon.
COFFEE—Venezuelan, 26c. per lb..
COPRA—8c. to 8½c. per lb.
DHAL—$10·25.
ONIONS—$10·00 per 100 lb.
PEAS, SPLIT—$9·00 per bag.
POTATOES—English, $4·00 to $4·50 per 100 lb.
RICE—Yellow, $12·00; to $13·00 White, $12·00 per bag.
SUGAR—American crushed, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., November 19.

CACAO—Caracas, 24½c.; Grenada, 23c. to 23½c.; Trinidad, 23¼c. to 23¾c.; Jamaica, 19c.
COCO-NUTS—Jamaica selects, $80·00; Trinidad $80·00; culls, Jamaica, $56·00; Trinidad $56·00 per M.
COFFEE—Jamaica, 22½c. to 25c. per lb.
GINGER—23c. to 27c. per lb.
GOAT SKINS—Jamaica $1·70; Antigua and Barbados, $1·65; St. Thomas and St. Kitts, $1·40.
GRAPE FRUIT—Jamaica, $2·00 to $3·00.
LIMES—No market.
MACE—40½c. per lb.
NUTMEGS—21c.
ORANGES—$2·50 to $3·25.
PIMENTO—9¾c. per lb.
SUGAR—Centrifugals, 96°, No market; Muscovados, 89°, No market; Molasses, 89°, No market.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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CONTENTS.

	PAGE.		PAGE.
Agricultural Show, Local	408	Manchester, The Cotton Trade in	403
Agriculture in Barbados	404	Manure Making in Mauritius, A System of	411
Animal and Vegetable Proteins in Rations for Laying Hens, Effects of	415	Market Reports	416
Camphor Seeds, Germination of	405	Moon, Effect of on Plants	415
Coco-nut Palm, Races of The	410	Notes and Comments ...	408
Cotton:—		Plant Diseases :—	
Residual Cotton Fibre	406	The Cacao Canker Fungus as a Cause of Coco-nut Bud Rot	414
Sea Island Cotton Market	406	Plantain Stalks as Fodder for Cattle	403
Filtered Water	409	Preservation of Perishable Products with Burnt Lime	413
Fish, The Fisherman ...	408	Rats in the West Indies	406
Fish-Skin Leather ...	409	Rubber Cultivation in Hainan	409
Gleanings	412	Science, Pure and Applied	401
Insect Notes :—		Sugar Prospects, German	402
Summary of Entomological Information, 1919	410	Sugars, Polarization Test of	409
Items of Local Interest	404	Sunn Hemp in Grenada	413

PURE AND APPLIED SCIENCE.

IN speaking or thinking, a distinction is often made between pure science and applied science, without any real understanding of wherein the difference between them exists, or on the other hand of the true relation between the two. As Dr. Schuster put it, in an essay appearing in *Science Progress* October 1919, these two branches of learning may best be considered as connected like the branches of a tree to its stem. In fact, as he remarks, the word science is equivalent to the word knowledge, and before knowledge can be applied it must exist; and knowledge by itself is not worth much unless it can be applied to a given subject. There is of course no antagonism between these two branches of knowledge, for on the one hand science lies at the foundation of the development of all the conditions of human life, and on the other hand there is something in science for which it deserves to be cultivated, apart from its application in field or factory.

Mere material comfort and wealth are probably naturally the first aims of mankind both as individuals and as societies; but mental as well as bodily health s to be also aimed at. Dr. Schuster puts the point excellently in his presidential address to the British Association in 1915, in the following sentence: 'the duty to work, the right to live, and the leisure to think are the three prime necessities of our existence, and when one of them fails we only live an incomplete life.' Just as applied science may be considered to conduce to the material prosperity of humanity, pure science may be looked upon as ministering to its mental welfare, in a manner not altogether unlike artistic or literary pursuits. Besides, it has a special value in this connexion, for science is continually helping to the better knowledge of the laws of nature which underlie the conditions of life, thus enabling men to base their action on reason, rather than on instinct or on the blind following of perhaps little understood precedents, and so it conduces to mental vigour.

The distinction between pure and applied science would seem to be rather the mental attitude of the worker than the degree to which the conclusions of

any particular research may be applied to any industry. Pure science has been defined as the search after knowledge for its own sake; applied science, on the other hand, may vary very much in its object, from such unselfish and unremunerative work as that of Pasteur for instance, down to the labours of a skilful inventor in order to exploit a patent. Not that the latter is to be thought ill of, for such work, although primarily intended for personal profit, ultimately benefits the whole community.

Sharp distinction cannot however be drawn between the two lines of research. For instance, the results in a chemical laboratory, of researches intended primarily to advance the utilitarian value of the products of a factory, have often led to the solution of problems which appear to be more of theoretical than of practical significance. On the other hand the pursuit of knowledge for its own sake, an example of which may be taken in Mendel's researches into cross fertilization of flowers, have had a far reaching effect on the practice of agriculture throughout the world. At the present time there appears to be some risk of pure science being eclipsed, on account of the necessity for increasing material production everywhere; and therefore the trend of opinion leans towards the encouragement chiefly of researches which will conduce to that desirable object. On the other hand it may be said that the greater the industrial need the greater the demand for research. This is doubtless true, but research only pursued with the special view of material and utilitarian application loses thereby its claim to be called pure science.

Oftentimes the student who frankly dovotes himself to the pursuit of knowlebge for its own sake is looked upon as an academic freak, or a somewhat selfish individual devoted to his own mental pleasure, and careless of the welfare of others. That this idea is largely a false one may easily be shown by examples of the lives of scientific men of all ages, from the Syracusan Archimedes to men of recent times like Sir Isaac Newton—not to speak of the scientists of the last five years—who have turned from abstruse speculation to give their time and their knowledge to the services of their country and their fellows, whenever occasion demanded.

In the older and more populous countries of Europe, along with other places where European races are predominant, with their educational and academic opportunities and traditions, there have always been, and there will probably always be devotees of pure science. It is different in newer lands with less population, where the mere fact of the necessity of material advance overshadows the outlook of science as a whole. Again, in smaller places the facilities for the pursuit of any scientific research can hardly be said to exist. Much has been said and written of late about the necessity of founding tropical agricultural colleges, especially in the West Indies, for the purpose of scientific study and instruction in matters relating to the agriculture, which is the foundation of the prosperity of the tropics in general. This is a question of pressing importance; and the pursuit of applied science thus undertaken and carried on to a still greater extent than at present, will doubtless be vastly stimulated by such institutions. It may not be too much to hope that the mental value of pure science may also be thereby inculcated and exemplified.

There are many men at present engaged in scientific research in various parts of the tropics including these West Indian islands, and good work has already been accomplished in many directions in scientific agricultural, entomological and mycological researches, in so far as these questions affect the industrial prosperity of the communities, but the problems attaching to the practical side of these scientists' work leave them little leisure or opportunity for research in the problems of pure science. The future may witness an amelioration of this condition, and perhaps the solution of problems in pure science which arise from tropical conditions.

GERMAN SUGAR PROSPECTS.

An article in the *International Sugar Journal*, September 1919, draws attention to the prospects of largely diminished production of German sugar in the 1919 20 campaign. The article states that official information discloses that there will be only 293 raw sugar factories at work, compared with 307 in 1918, and 342 in 1913. With respect to the beet sugar area under cultivation, it is stated that the present year shows a decline altogether of 19·4 per cent. It seems that the area cultivated this year is also so reduced that there is obviously a danger of a sugar famine next year in the German Empire, particularly as it would appear already that a considerable number of the factories will be unable to work anything like full time, because of the great difficulties that are to be expected in the matter of coal supplies.

Independently of what has been stated above, the prospects that are offered by the conditions of the beetroot fields at present suggest a still more pessimistic estimate of the production and the supply of sugar in the next campaign. The beetroots, owing to late sowing, shortage of manure, insufficient labour supply, and the bad weather experienced during their growth, must also show a considerable deterioration, particularly, it is said, in the large areas of Middle

Germany; and it is believed that scarcely an average harvest can be anticipated, even assuming that the sugar content of the root will be satisfactory. It seems certain that from October this year to March next year the German population will have to be content in the main with unrefined sugar. This scarcity will require the importation of large quantities of very expensive foreign sugar. It is obvious that with such a decline in the home production, the import movement, which has already begun to a considerable extent through Holland, will be one to cause deep reflection to sugar producers in a country which, previous to the outbreak of the war, was such an important factor in the world's sugar supply.

A recent note on the conditions of the German beetroot crop shows that the average weight of the sugar beet has diminished very much, compared with the average weight at the corresponding period of the last three years. The sugar content also shows a diminution.

PLANTAIN STALKS AS FODDER FOR CATTLE.

The *Tropical Agriculturist*, September 1919, publishes an article which contains useful hints as to the possibility of utilizing banana stalks for fodder, especially in periods of drought. In the West Indies the banana stalks are sometimes fed to hogs, but as a cattle food they are probably made no use of.

Among the several kinds of fodders hitherto known in Mysore, no mention seems to have been made of plantain stems, though the leaves, which are employed as dining plates, are sometimes given to cattle after their use. However, for this purpose, experience this year has shown that plantain stems, their leaves, and even the roots have been regularly fed to cattle in certain villages as famine fodder without any injury to the health of the cattle. The way in which the feed is prepared from the stem, and the quantity given to working and other cattle, and the good or bad effects on the cattle fed, are here stated for the information of such cultivators as may have plantain gardens of their own, or be able to get stems from other gardens.

The stems of plantains, after the bunches are removed, are usually cut about 6 inches from the ground, and are thrown into a pit without being used for anything. Instead of this they should be cut close to the ground, or dug out to a depth of about 6 inches below the ground. All dry leaves and dry sheaths should be removed. The remaining green stem, with the sheaths and the core, should be cut into small slices by a sharp sickle or large knife. This is easily done by cutting the stem crosswise. The pieces thus cut can immediately be fed to cattle without any addition of salt, or mixture of other foods to the slices.

Buffaloes eat the slices very readily. Some cows and bullocks do not like them at first. Experiments conducted on certain farms in feeding plantain stems and leaves to farm bullocks for one month prove that one meal of this stuff during the daytime can safely be given to working cattle. The highest quantity given to each working bullock was up to 20 lb per day. These bullocks received, in the evening, the usual quantity of 'kadbi' (half the daily quantity), and the concentrated food, and the meal during the daytime consisted entirely of plantain stems. The condition of the cattle was tested by actual weighing before and after the experiment with feeding plantain stems. There was not the slightest loss in weight.

It is a general belief among cultivators that cattle fed on plantain stems may purge, and consequently lose condition. Actual experiments have proved that such is not the case. The dung of cattle, fed up to 35 lb. of stems daily, was as hard as the dung of the cattle fed on 'kadbi' and chaff alone. Thus there is not the slightest risk in feeding plantain stems to cattle in general, and especially to buffaloes, cows, and young stock. The knowledge of these facts will be very useful in villages where there are plantain gardens, but where the stems are now wasted. If all the stems are properly cut and fed to the cattle, it will be a great addition to the present stock of fodder, which would help to keep a large numder of cattle in good condition in critical periods of drought.

THE COTTON TRADE IN MANCHESTER.

The following extract frtm *The Times* Trade Supplement, November 15, 1919, will doubtless be of interest to our readers :—

The chief lesson which has been learned by the delegates who have returned to England from the World's Cotton Conference at New Orleans is that no effort should be spared to grow cotton in all parts of the world in which it can be grown on commercial lines. If this be not done, cotton, which is exceptionally dear now, will become dearer still, and, in European countries at any rate, will be scarce.

Other points which were elucidated at the conference may be briefly summarized. Many of the mills in America work fifty-five and as many as sixty hours a week. Wherever possible, piece rates are paid, and there is no slackening. The rate of production is about equal to that in England, but the quality of the work is not as high. Not 10 per cent. of the American cotton operatives are organized. They are made up of mixed nationalities. In some mills notices are printed in five languages. Collective bargaining on matters of wages and hours is not common, though it has been introduced in some places and is growing.

The untidy American cotton bale, which on this side of the Atlantic has been an object of scorn for years, found no defender at the conference. Every one condemned it, and admitted that cotton buyers were entitled to have their purchases, which make long journeys both by rail and sea, properly packed. Another innovation was the admission by growers that their plan of leaving bales of cotton lying about in the open while awaiting transport, liable to be soaked by rain, could not be defended. A movement is now on foot for the erection at various centres of suitable shelter in the form of warehouses.

No change is noticeable in the general state of trade. The supply of goods is still inferior to the demand which comes from all parts of the world, with the inevitable result that prices are high, and delivery is delayed. The ordinary relations of buyer and seller are reversed. The seller is in the commanding position. The buyer has to use all the arts which his ingenuity can suggest. Many orders are given on general terms. the manufacturer, unwilling to commit himself to anything definite, promising no more than that he will do his best to meet his customers' requirements.

Results of experiments at Angleton, Texas, show that cotton seed, produced and kept in dry parts of the State, proved superior to that produced in humid sections. Cotton yielded 30 per cent. more in rotation with corn, oats, and cowpeas, than under continuous cropping, the fourth year of the test. (The *Experiment Station Record*, June 1919.)

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Plant distribution during November included: limes, 300; oranges (budded), 36; mangoes (grafted), 7; sweet potato cuttings, 300; ornamental, 20; various economic, 3; kidney bean seeds, 1 packet; various seeds, 1 oz. Regarding staple crops, the Acting Superintendent of Agriculture, Mr. W. O'Brien Donovan, states that cacao is in heavy bearing; the market continues firm, and a large number of growers—both large and small—find ready and apparently satisfactory sale for their produce in the Port-of-Spain market; and there are indications that growers will continue to dispose of their produce in this market, rather than ship it direct to the London or New York markets. The lime crop in Carriacou is said to be a good one. About 12 acres at Westerhall have been cultivated in Marie Galante cotton by settlers of Carriacou, who obtained land from the Government under the Land Settlement Act. The cotton has grown beautifully, is healthy and in bloom. Coco-nut trees at the Westerhall experiment plot are affected with red ring disease. Intermittent showers fell during the month, the rainfall recorded at Richmond Hill being 7·96 inches.

ANTIGUA. Heavy rains during November impeded cultural operations in the Experiment Stations. Plant distribution comprised: 2,000 *Agave sisalana*, 16 cacao, and 17 decorative. The sugar-cane crop throughout the island, Mr. Galwey, the Acting Curator states, continues to make rapid growth under the influence of good rains. The preparation of lands for the planting of next year's cane crop, however, has been at a standstill for the greater part of the month. Severe attacks of caterpillars were experienced during the month, which entirely defoliated plants in most districts of the island. Cotton stainers were also common in all fields. A small percentage of the bolls on the plants in the English Harbour district were found to be infected by internal boll disease. Mr. T. Jackson vacated the post of Curator and Agricultural Superintendent on November 8, and left for St. Vincent on the following day. The rainfall for the month was 15·43 inches. Within the space of six hours 4 inches of rain fell on the morning of November 29. The total precipitation for the year to date is 48·81 inches. Five earthquakes of moderate violence were recorded during the month.

A short report on agricultural instruction for the month of November, appended to the foregoing, emphasizes severe attacks of cotton caterpillars and cotton stainers in the cotton fields throughout the peasant holdings.

ST. KITTS. Mr. F. R. Shepherd, Agricultural Superintendent, records usual routine work in the Botanic Gardens during the month of November. The sugar-cane crop, he states, has responded to the good rains of the past month, and the prospects for the coming season are most favourable; the canes in the Valley district have considerably improved, and large returns are expected. The planting of the young crop is being pushed on, and efforts are being made to secure the best varieties. The Barbados seedlings B.H.(10)12, and Ba.6032 are in great demand. It is expected that all the muscovado estates in the Northern district will make syrup, most of which has been already sold at 2*s*. 6*d*. per gallon, puncheons supplied. The cotton crop is now practically reaped, and the land put in canes. The returns, on the whole, have been favourable, and the quality excellent. The cotton stainer has been considerably less abundant than in the previous year, and did no damage to cotton on the estates. The cotton worm has been very prevalent and troublesome during the month, but little damage has been done. Special efforts are being made by means of collecting in pans with kerosene and water, to keep the stainers in check on the Government Cotton Farm, so as to reap the second bearing, which so far has been satisfactory. Trials of calcium arsenate as a poison for cotton worms, are also being undertaken. The rainfall for the month was 6·25 inches; for the year to date, 47·59 inches.

MONTSERRAT. Plant distribution during November included: 1,925 lime plants, 1,300 bay, 56 loblolly (for a wind break), and 18 packets of various beans. Trials with calcium carbonate, Mr. Robson states, did not appear to be very successful in controlling cotton worms. The weather has been too rainy and damp for the successful development of the second crop of cotton, but if fine weather is experienced in December, considerable pickings, it is expected, will be made from certain areas. This applies more particularly to areas not severely infested with cotton stainers, and where defoliation has not resulted from the attacks of cotton worms. Old plants have already been uprooted from areas when the crop is practically over. Very severe attacks of cotton worms were experienced during the month, and quite large areas were denuded of foliage. Cotton stainers were found to be serious in one district, but taking the island as a whole, are probably not as plentiful as in previous years. Samples of commercial cotton have been sent to Canada at the request of a firm dealing in Sea Island cotton. The price paid locally for Sea Island seed-cotton rose from 6*d*. to 8*d*. per lb.; baled lint is being bought locally at 3*s*. 3*d*. per lb. Arrangements are being made to proceed with the destruction of the remaining silk cotton trees in the island. It is of interest to record that one grower of a considerable area of bay trees has erected what appears to be an efficient distilling apparatus. At a meeting of the Agricultural Society, two delegates were appointed to attend the forthcoming meeting of the Associated Chambers of Commerce to be held in Barbados. The rainfall recorded at the Grove Station during the month was 11·69 inches, with a precipitation of 4·35 inches on the 11th; the total rainfall for the year to date is 55·64 inches. There was a conspicuous lack of sunshine during the month.

AGRICULTURE IN BARBADOS.

The closing days of November, unlike those of the same month last year, were very showery. Indeed in some districts, practically half the amount of rain which fell during November was registered between the 25th and the 30th.

The month of December, therefore, found the earth quite wet, and vegetation making rapid strides. The first day of the month was also showery; the sky was overcast and promised a general downpour. In the north and north-eastern parts of the island a soaking rain fell, but the southern parishes were not so favourably treated. Since this date comparatively no rain had fallen south of a line drawn across the island in the neighbourhood of the row of hills on which the old Gun Hill Signal Station stands, but north of such a line there have been six showery days totalling 2 inches. The result has been a great contrast between the progress made by the old crops, and the start made by the young plants in this part of the island, as compared with conditions in the southern part.

It will be seen that rain is greatly needed over half the island, if there is to be a satisfactory spring of the young crop, and if the old crop is to make up for some of the lost time caused by the severe drought which prevailed during the first half of the year.

The planting season is still in full swing. Some estates in the black soil have finished, but the majority have still some acres to plant. Even in St. Lucy, where planting is as a rule most forward, plants are still being cut everywhere. It is, as yet, too soon to pronounce on the general start made by the young crop, but we have been very favourably impressed by the vigour of the shoots seen by us in some fields, while in others we do not think the start has been as regular as was expected. In the south of the island, planters are somewhat anxious concerning the plants put in ten days ago. A rain is very necessary immediately after planting to settle plants in their new habitat, and to induce immediate germination; but very much also depends on the quality of the plant, and on the condition of the soil. Again, we believe that some plants should be planted with the drill and others with the fork. A good deal depends on the kind of eye which the seedling has.

At a meeting of the Agricultural Society held on the 5th instant, it was advocated by the Hon. G. L. Pile that the sugar-cane experiments carried on by the Department of Agriculture should be extended by the establishment of one or more additional experimental stations. This would be an excellent plan, but could not many planters assist in this matter by themselves experimenting on a small scale with the assistance of the Government Department of Agriculture?

We are very pleased to state that, with the weather which has prevailed in the north of the island, the cane crop there has developed splendidly. In St. Lucy, right down to the seashore, the fields have so far improved that it seems probable that next year's crop will be only inappreciably behind this year's results.

In the black soil the yam crop shows fair promise, but in other parts of the island a very moderate return is anticipated; some fields are altogether a failure.

Since this report was written a very refreshing rain has fallen in the southern part of the island, and we learn that on Thursday night a rainfall of 5 inches was registered in some parts of the parish of St. Lucy. (The Barbados *Agricultural Reporter*, December 13, 1919.)

GERMINATION OF CAMPHOR SEEDS

In view of the interest which is now being taken in the cultivation of camphor trees in many parts of the tropics, an article published in the *Jonrnal of Agricultural Research* August 15, 1919, on the effect of removing the pulp from camphor seed on germination and the subsequent growth of the seedlings is of importance.

It would appear that it has been noted in various places that the germination of camphor seeds has been uniformly low. In Florida, for instance, in commercial plantings, where unpulped seeds have been planted with a modified cotton-seed dropping machine, the average number of seedlings brought to transplanting age on 1 acre of seed bed has been approximately 20,000. Now to plant an acre of seed bed requires approximately 200,000 seeds. The germination has therefore averaged only about 10 per cent., which corresponds with the results recorded in various other countries. As a consequence of this low germination there has been no great extension of camphor planting on a large scale in Florida, because of the limited number of seedlings annually available.

The author of the article referred to above, Mr. J. A. Russell, of the Bureau of Plant Industry, United State Department of Agriculture, has undertaken a series of experiments in germination of camphor seed after different treatments to determine, if possible, the cause of this low germination

Seed from a tree growing in the vicinity of Orlando, Florida, was selected for the purpose of the experiment. This tree was twenty years old, and was a typical example of the camphor trees in Florida from which seed is gathered for commercial planting. The author describes in detail the conditions under which the various lots of seed were collected, and the treatment of each before planting, and he then details the experiments. The most notable result appears to be the very greatly increased germination obtained when the seed is pulped.

The following is Mr. Russell's summary of the results of these experiments:—

In the season of 1916-17 camphor seeds were planted under various conditions. The experiment was repeated in the season of 1917-18, and commercial conditions were closely approximated.

'Removing the pulp from the seeds were found to hasten germination by an average of two weeks; it also gave an increase in germination of approximately 5·25 per cent. over that of unpulped seed.

'Drying the seed with artificial heat at 55° C. destroyed all vitality.

'Soaking the seed in water apparently did not hasten germination; neither did it increase the percentage of seed that germinated.

'Soaking the seed in sulphuric acid of 5 per cent by weight destroyed all vitality

'Seeds picked up from the ground showed less vitality than those picked from the tree, but removal of the pulp increased and hastened germiuation.

'Allowing the seed to ferment, and the pulp to decompose in closed vessels destroyed all vitality.

'A freeze on three successive nights, during which the temperature fell to 26° F, did not destroy the vitality of all the seed; it did, however, impair the vitality, and reduced the number of seeds that germinated by approximately 50 per cent.

'Seeds planted early in the winter required a longer time to germinate than those planted in mid-winter. The former average more sturdy trees.

'When the pulp was removed, and the germination of the seeds was hastened, a larger and more sturdy seedling tree was obtained for transplanting than when the pulp was not removed. The increase in the number of seedlings of transplanting size secured by pulping the seed amounted approximately to 600 per cent.

From a commercial point of view, removal of the pulp is derirable, even through the labour must all be done by hand. The increased germination, and the well developed trees that result, will repay many times the cost of the labour involved.

'It is believed that in commercial plantings the removal of the pulp from the seeds will increase the percentage of germination by at least 200 per cent., thus producing 40,000 more seeding trees to each acre of seed bed. This estimate is believed to be very conservative, and even a much greater increase may be expected.

COTTON.

SEA ISLAND COTTON MARKET.

The report of Messrs. Henry W. Frost & Co. on Sea Island cotton in the Southern States, for the week ended November 29, 1919, is as follows :—

ISLANDS. The market was quiet throughout the week and no sales reported, with Factors unwilling to make any concessions to sell their limited offerings, and continued firm in their asking prices. However, towards the close of the week sales were made on private terms at some decline, and should no better demand spring up we may succeed in buying this coming week, when the offerings will be larger, at our inside quotations, viz. :—

We quote :—

Fine to Fully Fine @ 84½c. to 85½c., f.o.b. and freight.

GEORGIAS AND FLORIDAS. There continues a good demand for the offerings on a basis of quotations, the buying being on account of the Northern Mills. The holders of cotton are still expectant of higher prices later on, and are rather firm in their views. The sales consist principally of cotton brought over from the crops of 1917-18 and 1918-19, there being a limited supply of new crop cotton, as only 2,744 bales were ginned up to the 14th inst.

We quote viz :—

Average Extra Choice, @ 83c. f.o.b. and freight.

The exports from Savannah for the week have been, to Northern Mills 657 bales and from Jacksonville to Northern Mills 602 bales.

RESIDUAL COTTON FIBRE.

Two years before the war broke out, a machine was devised which effects a complete separation of the remains of the decorticated woolly cotton seed (cotton seed hulls) in the United States into their component parts of short cotton fibre and shell-remains, the latter being a much better material for the manufacture of mixed feed than the woolly hulls. The short cotton fibre is delivered by the machine in so clean a condition that it yields 70 per cent. of cellulose. It immediately found a market at good prices for the manufacture of high grade paper, explosives, vulcanized fibre, etc, and practically the whole output of the factory in the United States was sold for the manufacture of explosives during the war.

Quite recently another machine has been perfected which removes the residual fibres from the 'woolly' seeds to any desired degree without injury either to the seed or to the fibre. This fibre-product is of greater purity and of higher quality than that separated out from the decorticated hulls. On analysis the yield of cellulose has been found to be as high as 87 per cent., or within a few per cent. of that of raw long cotton.

This material has been pronounced by Courtaulds (Limited) to be suitable for the production of their artificial silk, and the Ministry of Munitions of War, at whose instructions it was examined last year, have certified its suitability for the production of nitro-cellulose powders Both these machines were worked out by a British engineer and developed entirely by private British enterprise.

Enormous quantities of 'woolly' cotton seed are produced within the Empire, the greater part of which is now—economically speaking—wasted The production of woolly cotton seed bids fair to increase greatly in the future, and by means of the last-named machine these seeds can be converted into 'crushable' seeds for the British oil mills, thus largely extending the available supplies and producing, concomitantly, considerable quantities of short cotton fibre, a raw material for paper making and many other industrial purposes, the value of which has now been established commercially.

Should the American decorticating system come to be adopted in Great Britain, this machine would be used for reducing the quantity of fibre on the woolly seeds to that necessary for efficient decortication, and the first-named machine would be employed for recovering the remainder of the residual fibre from the decorticated seed-remains. (*The Times* Trade Supplement, October 25, 1919.)

RATS IN THE WEST INDIES.

Rats seem to have been a pest in sugar-cane fields in the West Indies from very early times. Sir Daniel Morris, in a pamphlet, entitled The Mongoose on Sugar Estates in the West Indies, which was published in Jamaica in 1882, speaks of the introduction of the mongoose into that island for the 'purpose of destroying the plague of rats which have always, more or less infested sugar estates and caused considerable loss by their ubiquitous depredations. As a consequence, rat catching has been an important item in all sugar estate expenses, not only in Jamaica but in all the West Indian islands ; and for the last two hundred years numerous suggestions have been made to cope with an evil which, in spite of rat catchers, dogs, baits and poisons, has remained as great as ever.'

In Jamaica, at that time, three kinds of rats were recognized. They were the common black and brown rats of Europe, and one known as the cane-piece rat, which was said to have been named by Gosse, *Mus saccharivorus*.

As a means of control, the European ferret was introduced into Jamaica, but proved to be of no use, as it suffered so severely from the attacks of the chigoe (jigger) flea.

In 1762, one Thomas Raffles brought over from Cuba an ant (*Formica omnivora*) which came to be called after the introducer, 'Tom Raffles ant,' and strange as it may appear, the Tom Raffles ant has remained to this day a firm friend to the sugar planter, and a foe to all pests of rats and vermin.

The Agua or South American toad was introduced in 1842 as another check on the rats.

The foregoing refer principally to Jamaica, being taken from the pamphlet by Morris as mentioned above ; but the conditions as to rats must have been quite as bad in other islands, for it is recorded that while the mongoose was introduced into Jamaica in 1872, it was introduced into Trinidad in 1870, and into Barbados in 1877 or '78.

Morris gives a chapter on the rat situation in Barbados, in which he states: 'Owing to the serious injury caused by rats to canefields in Barbados, an Act was passed, entitled Barbados Law No. 439, dated the 9th July 1867, for encouraging the destruction of rats ; and by force of which the Treasurer of each parish was bound to pay one penny for every rat head brought to him.' According to official returns the amount paid for rat heads during the years 1875 to 1879 inclusive, was £2,726 18*s.* 3*d.*, and thenumber of rats thus accounted for, amounted to 654,459.

In Trinidad, the rat situation must have been about the same as in Jamaica and Barbados, for the mongoose was introduced into that island before the others, and for the same purpose i.e. the destruction or control of rats

It is probable that if the exact dates were available, it would be found that the introduction of the mongoose into Antigua, St. Vincent, St. Kitts, and Grenada took place at about the same time as that into the islands already mentioned, and it is known that it was for the same purpose.

There would appear then to be no doubt that there was throughout the West Indies a very general plague of rats, and that all other methods of control having failed to give a satisfactory relief from their ravages, the mongoose was introduced during the years immediately following 1870.

For the first few years the results appear to have been all that was desired, the rats were very much reduced in numbers, and the damage done by them was, for a time at least, very much less than it formerly had been.

To quote again from Morris: 'as to the conditions in Jamaica, there can be no doubt that on sugar estates the mongoose has fully realized the hopes held out respecting its powers as a rat catcher; and sugar planters all over the island speak in the most unqualified terms of the good it has done in destroying the rapacious "cane-piece" rat, and reducing the expense of rat-catching in all its phases' It was estimated that the total saving to the island was at the rate of nearly £45,000 per annum,' within a very short time after its introduction.

Urich states that 'the first occasion on which attention was paid to the presence of the mongoose in Trinidad, was at a meeting of the Agricultural Society in 1898, when the following is recorded in the minutes: "In regard to a letter addressed to the Colonial Secretary by the Field Naturalists' Club drawing attention to the objections to the introduction of the mongoose into the colony, and to a further letter from Mr. Eugene Lange stating that he had introduced and let loose on his estate at Santa Cruz five specimens of the mongoose, it was resolved: that in the opinion of the Society, the importation of the mongoose should be absolutely prohibited, and that this Resolution be forwarded to the Colonial Secretary for the information of His Excellency the Governor."'

The same writer also states that it was about 1898 when 'the mongoose which had originally been considered beneficial in Jamaica, where it had been introduced in 1872, became a great pest there through its omnivorous habits.'

It appears that in 1882 the Rat Destruction law of 1867 in Barbados was repealed unconditionally, the sugar planters being left to deal with the rat plague as best they might.

This was about five years after the mongoose had been introduced, and at this time the rat injury to canes had already largely abated. Morris (in 1882) writes: 'Managers, superintendents, and labourers are unanimous in testifying that there have been fewer rat-eaten canes during the last two years than before the introduction of the mongoose.'

Rats continue to do a considerable amount of damage to sugar-canes in the West Indies, in spite of the activities of the mongoose. In Jamaica, it would appear that rats are pests of the first importance. A glance through the indexes of the volumes of the *Journal of the Agricultural Society* will reveal numerous references to rats in recent years. These relate to short articles on the damage done by rats, to brief notes by the editor, from correspondents on the importance of taking all possible action against rats, etc. There are also notes on rat traps, rat virus, and rat poisons. In one volume—that for 1908, for instance—there appear thirty-one page references to these headings.

In Barbados, a Commission was appointed on September 25, 1911, to take evidence with a view to determining in what districts of the island rats have increased and are damaging the cane crops, and to take such steps as may be necessary to ensure that a proper number of mongooses be sent from those districts to a person to be appointed to examine the contents of the stomachs of 100 mongooses, with a view to ascertaining whether they are of much use in the destruction of rats.

This Commission found that in those parishes where large numbers of mongoose had been destroyed, there had been a great increase in the numbers of rat-eaten canes, and that in other parishes, where either there had been no destruction of mongoose or only small numbers had been destroyed the injury to the canes was proportionately small. The Commission came to the conclusion that the effects of the Mongoose Destruction Act had been to reduce so considerably the number of mongooses in certain districts as to cause a great increase in the damage to the canes in those districts.

It was decided that in view of the examination of the fifty-nine mongoose stomachs by the Rev. N. B. Watson, it was unnecessary to have any more stomachs examined, and it was stated that no evidence could be obtained to prove that the mongoose was responsible for any increase in the damage done to the cane crop by insect pests.

The report concludes with the following: 'We are of opinion that the benefit to the cane crops derived from the presence of the mongoose is so great, that a stop should at once be put to their destruction, and we therefore recommend that the Mongoose Destruction Act of 1904 be repealed.'

As an appendix to the report, figures were given to show the numbers of rats and mongoose killed and recorded since the Acts came into force, and up to October 1911. The number of rats killed and paid for during the period 1908-9 to 1911, was 56,578, while the figures for the mongoose during the same period were only 33,974.

The Report of the Select Committee of the House of Assembly in 1917, refers to the fact that after the introduction of the mongoose the damage to sugar-canes was much less severe. It explains this, however, by suggesting that it might be due, in part at least, to the cultivation of seedling canes, which having harder rinds are less attacked than the varieties grown in earlier times. It is also suggested that the rats have been driven from the cane fields to seek their food in other localities. In this connexion mention is made of the habit of rats living in trees, and of their having taken to estate buildings.

The Select Committee came to the conclusion that the operations against the mongoose ought to be continued under the provision of the Mongoose and Rat Destruction Act, 1909, but nothing is said about the destruction of rats.

Methods of control. Trapping, hunting, and the use of poisons and rat virus have all been tried, especially in Jamaica. The efforts of the mongoose are much appreciated in rat control in Jamaica, and it would appear that much good work is being done privately by estate owners and managers in rat control by trapping. Rat virus does not seem to have been successful, although it would appear to have been very extensively experimented with. In the other islands rats are largely left to the mongoose.

H. A. B.

With regard to the statement in an article in the previous number of the *Agricultural News*, that the Sea Island cotton is believed to have been transported into Anguilla from Persia, the writer has evidently made a mistake. Sir George Watts, in his book 'The Wild and Cultivated Cotton Plants of the World', concludes, after full discussion of the point, that the modern Sea Island cotton probably originated as a natural hybrid between *Gossypium barbadense* or *G. vitifolium* with *G. brasiliense*, and has been continuously improved by selection and cultivation into its present valuable form.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents will be found on page 4 of the cover.

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†*Provided by the Imperial Department of Scientific and Industrial Research.*

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NOTES AND COMMENTS.

Contents of Present Issue.

The distinction between pure and applied science, and the relation of these two branches of knowledge to one another, is the subject of the editorial in this issue.

Under Insect Notes, page 410, will be found the conclusion of a summary of entomological information in 1919.

Observations on the cacao canker fungus as a cause of coco-nut bud rot will be found under Plant Diseases, page 414.

On page 411 will be found an interesting article on a system of manure making in Mauritius.

Local Agricultural Show.

In Barbados, under the auspices of the Local Department of Agriculture, peasants' shows have been held from time to time in different parts of the island. This year, at Blowers estate in the parish of St. James, on December 3, possibly in some respects the most successful of these shows took place. The exhibits of fruit and vegetables, both from the gardens of elementary schools and from the holdings of the peasants, were very satisfactory. The products were well grown and well selected. After the distribution of the prizes by His Excellency the Governor, Mr. J. R. Bovell, Director of Agriculture, in a speech to the peasants, teachers, and children who had sent exhibits, uttered well deserved words of commendation on the progress they had made. Very noticeable improvement was shown in the products exhibited from elementary school gardens. Again this year prizes were offered for boys of elementary schools for work in digging cane holes, forking land, etc., and some really good work was performed. For the first time similar prizes were offered to girls of elementary schools, and they too did very creditable work. Another interesting feature of the show was an exhibition of collections of insects, made by pupils of elementary schools, which were neatly and intelligently arranged. It is to be regretted, however, that the number of exhibits of live stock, large and small, was not as large as might have been expected, though the individual specimens were good.

These local exhibitions must tend to the general improvement of agriculture, and the stimulation of interest in their work among the labouring class.

The Fisherman Fish.

In the *Agricultural News*, September 20, 1919, an article was published drawing attention to papers contributed to the *American Naturalist* by Dr. E. W. Gudger, on the use of living sucking-fish for catching large fish and turtles. In the November-December, 1919, number of the Journal referred to, Dr. Gudger concludes his studies. Doubts have been expressed whether the old accounts, which Dr. Gudger referred to in previous papers, were credible. In this concluding paper he proves by recent and personal experiment that all the evidence sustains and confirms the stories of these living fish-hooks from the time of Columbus to the present day. For instance, the author states that in 1914 he pulled on the tail of a sucking-fish stuck fast to the glass wall of an aquarium, so hard that he had to desist for fear of pulling the tail off. Again on another occasion he caught a 27·25 inch Echeneis, having a sucking disk 6 inches long by 2·13 inches wide. He pulled on this fish, when stuck to the wet deck, so hard that he feared he would tear it in two but it resisted all efforts to pull it off backwards—a pull of possibly 50 lb. On pulling upwards on it, it held fast until the disk began to tear loose from the head.

Another coroboration of the credibility of the stories concerning the employment of the sucking fish is afforded by the fact that many accurate records exist

of the capture of very large fish, weighing several hundred pounds, on lines breaking at a dead weight pull of not more than 48lb. It is therefore quite credible than an Echeneis, which resisted a backward pull of about 50lb., could easily be used to draw in fish and turtles of the size which it is reported to have done.

Fish-Skin Leather.

The Bureau of Fisheries of the United States reports that excellent progress in the tanning of fish leather has been recorded, and that a number of the difficulties that had retarded the development of the industry had been overcome by the tanners.

Science, October 24, 1919, states that one company which is tanning fish skins has established a station in North Carolina and another in Florida for the purpose of capturing sharks and porpoises, and is meeting with success in its fishery for sharks. It is understood that the number of stations will be increased as rapidly as possible. Another company, which has recently acquired a site for a tannery in Washington, also plans to tan the hides of sharks, beluga, etc.

Samples of such leather recently submitted show the leather to be soft and pliable, and it appears to have ample strength for many uses.

The nets which the Bureau of Fisheries developed for the capture of sharks are proving successful, and are being adopted for the shark fishery. At the fishery stations the oil is extracted from the shark livers, and the fleshis converted into fertilizer, so that nothing is wasted.

The Polarization Test of Sugars.

The *International Sugar Journal*, September 19, 1919, draws attention to an article by Dr. W. D. Horne, contributed to a recent number of *Facts About Sugar*. In this article two types of raw sugar made in the West Indies are compared. Their polarizations were, respectively, 96·7 and 95·9, and if the polarization alone were the criterion from the refiners' point of view, preference should be given to the first. As a matter of fact it was decidedly inferior to the second for the refiners' purposes. It owed its high polarization largely to its unusually low water content (0·69 as compared with 1·35 per cent. in the second); it contained about five times as much gummy matter as the other; its grain was irregular; it washed with difficulty in the centrifugal, and the liquors spun off abounded in insoluble matter, troublesome in defecation; it had a decided caramel colour (which is reluctantly given up to animal charcoal). Therefore it is clear that this sugar had been made without due care, and had been overlimed, so that during heating there had been a partial destruction of the reducing sugar in the alkaline medium, with the formation of dark decomposition products. Moreover, it was apparently made by working back low products into the first sugar, having no regard to the fact that this mingling of impurities had to be undone in the refinery. Refiners in their own interest should show preference for sugars of the second type, which wash readily in the machines, have a good colour, are regular in grain, and give very little insoluble matter.

Filtered Water.

In districts where there is an impossibility of obtaining pure and wholesome water for drinking purposes, the most usual resource is a filter of some kind or other. The *Colonial Journal*, October 1919, states in this connexion that the Senior Sanitary Officer, Northern Provinces, Nigeria, reports that the ordinary travelling filter is a delusion and a snare; when it is most needed, the water calling for filtering is so thick that, particularly if the filter is of the pump variety, it cracks the candles, and is practically of no further use.

A much better device than the travelling filter takes the form of a large tin funnel and a packet of large sized, chemical laboratory, filter papers. If the water be dirty it is passed through a filter paper; the paper is then thrown away, and the water is boiled; the filtration thus effected renders the water, if not quite inviting to the sight and taste, at least tolerable, while the boiling makes it safe.

It is sometimes necessary to begin by heating the water, if it be too thick when cold to pass through the filter paper readily. It is stated in the article referred to above that numerous Europeans have adopted this method of water purification, and that very few who have given it a trial are likely to return to the use of the travelling filter.

In connexion with water purification, it is stated that, since the New York Department of Water Supply added a small amount of chlorine to the water, not a single case of typhoid fever has occurred which could be traced to the city water. It is further noted in the same article that the equipment devised by a British chemist for the use of the army in France was so perfect, that on a barge it could pump foul water from a canal, and deliver it in large quantities purified for drinking purposes.

Rubber Cultivation in Hainan.

The manner in which the cultivation of rubber is spreading throughout the East is shown in the development of this product in the Chinese island of Hainan. The cultivation is chiefly undertaken, according to the *Journal of the Royal Society of Arts*, October 31, 1919, by returned emigrants from the Malay States, and it is likely to develop into an important industry. One company has planted 6,000 rubber trees in one district, and another company 45,000 trees in another district. Tapping was begun on the former plantation in 1916. The product was shipped to Singapore, and reported on as of first quality.

About the middle of 1917, a Chinese merchant in Singapore obtained a grant in Hainan of 100,000 acres of land on which to grow 5,000,000 rubber trees. When they are in a flourishing condition he has guaranteed to pay a royalty of $1 per tree to the Government.

Heretofore this tropical island has been chiefly devoted to the production of live stock, especially swine and small beef cattle; sugar, rice, ginger and other crops are grown. The area said to be suitable for rubber growing includes a very large part of the island.

INSECT NOTES.

SUMMARY OF ENTOMOLOGICAL INFORMATION, 1919.

(Concluded.)

The report of the entomologist in charge of insect control work on certain groups of estates in British Guiana (see p. 346) gives records of insect collectionsand other means of control. The insects dealt with are pests of sugar-cane. Entomology in Porto Rico is the subject of a review (p. 352) of the Annual Report of the entomologist of the Insular Experiment Station, Porto Rico, for the year ended June 30, 1918. The white grubs of sugar-cane constitute a serious menace to the success of the sugar industry. It is recommended that the American skunk and the West Indian toad should be introduced into Porto Rico as an aid to the control of these hard backs and their grubs. On page 351, in a note on skunks and toads, attention is called to the fact that in its native habitat the skunk sometimes becomes a nuisance to the poultry keeper, although it does not often become a serious pest. The warning is given, however, that with such an animal it is not known how it will adapt itself to its new surroundings, and the mongoose is an example of an animal useful in some ways which has become a serious pest. In this connexion also, the article on page 378 gives an account of the toad in the West Indies, which is considered a most useful agent in keeping insect pests in check.

On page 138 will be found a review of an article on the food of the mongoose, which gives interesting facts regarding the food of this animal as shown by stomach examinations and a comparison is made of the food obtained by the mongoose in the wet and in the dry seasons and in those districts in which the mongoose has been established for a long time, as compared with the more recently infested regions of Trinidad.

Notes dealing with plant legislation have appeared as follows: at page 105 an account of the establishment of a close season for cotton at Barbados; at page 121 notice was given of two enactments prohibiting plant importation in St. Lucia, one dealing with citrus plants, and the other with growing coco-nuts from certain places. Similar prohibitions in Antigua are referred to on page 105.

In Grenada (p. 136) the importation of citrus plants from certain places is prohibited by proclamation. Legislation in Montserrat for the destruction of the wild food-plants of cotton stainers is mentioned on page 153.

Cockroach control (p. 11) gives an account of experiments with traps, and with borax and boric acid in the control of these insects. Cockroaches eat these substances not as food but in the effort to keep themselves clean. The particles which have adhered to the legs and antennae are removed by means of the mouth parts, and a certain amount of the material is swallowed. A note on an outbreak of field crickets (p. 11) gives a brief account of severe injury caused to young plantings of trees and vines by enormous numbers of the common field cricket in California. Flooding the vineyard or orchard was found to be the most successful treatment. Under the heading Miscellaneous Insects (p. 74), mention is made of several insects which had been recently identified at Washington or London. On page 187 a note, entitled Living Insects by Post, gives an account of the sending of a destructive grasshopper into California, in violation of the law. The insects were to be used in trick photography before the motion picture camera.

On page 394 there appeared a review of a report on an invasion of certain districts of British Guiana by locusts from Venezuela, in which are given the main points of the life-history, and the methods adopted for the control of the insect.

Notice of the occurrence of the European corn borer in the United States was given in the Insect Notes on page 186. This is a destructive insect with a wide range of food-plants.

Notes on some insect pests on tropical crops (p. 90) refer to the experiments in the poisoning of the Mexican cotton boll weevil in the Southern States. The poison used was calcium arsenate, which was applied by means of special machinery. An attempt at eradication of the sweet potato weevil on a large scale is being made by means of experiments and large demonstration plots in several Gulf States. Investigations of certain insect pests of citrus fruits in California have resulted in freeing a demonstration plot of 20 acres from the citrophilus mealy-bug, by the combined effect of control of the argentine ant, spraying, and the utilization of natural enemies.

The control of the fluted scale on citrus trees has been accomplished at New Orleans by the propagation and liberation of thousands of its natural enemy, the Australian lady-bird.

Batocera rubus an imported beetle recently established in the Virgin Islands and recorded from Trinidad, is a serious pest in the former locality (p. 202)

Notes on some insect pests in Costa Rica (p. 250) refer to the occurrence of the Hawaiian sugar-cane weevil borer, the purple scale, and the spiny citrus white fly.

Casuarina and mangrove trees in Florida are recorded as being attacked by the same boring insect in the notes on page 282. A note on the food of the wasps which are parasitic on the soil grubs of the West Indies is given on page 298 and on this page there is also an account of insects being attracted by smoke. An article on the control of mosquitoes is given in two numbers at pages 42 and 58.

Two articles on popular entomology are given on page 330. These refer to mistakes made as a result of the use of different common names for the same insect, and some ludicrous statements made in careless writing on entomological subjects.

H. A. B.

RACES OF THE COCO-NUT PALM.

In a special article contributed to the *Philippine Agricultural Review*, on the coco-nut, its culture and uses, Mr. P. J. Wester, Agricultural Adviser to the Philippine Agricultural Department, remarks that there is still much to learn about coco-nut varieties, as very little systematic study has been made of them. Existing literature seems to indicate that there are altogether not more than thirty-five distinct coco-nut varieties, a remarkably small number considering the antiquity of its cultivation and its wide distribution. The coco nut is a plant that must be propagated from seed, and is very long-lived, therefore this constancy of characteristics is a distinct advantage to the cultivators of this tree. Were the coco-nut to be nearly as variable as most of the trees cultivated for the sake of their fruit in various parts of the world, the planting of coco-nuts would be a much more hazardous undertaking than it is now

The different races seem to vary in the size of the nut, in the percentage of the copra obtainable from each nut, in the number of nuts produced, and in precocity.

Coco-nut plantations are chiefly cultivated for the production of copra, hence the tree bearing nuts with the largest percentage of this product are the most desirable for planting. In selecting a variety however, for the production of copra, the one with the largest nuts will not necessarily turn out the most profitable. The preferable variety is the one that produces the highest percentage per tree of copra. A variety bearing small nuts, but a large number of them, may thus be preferable to one that bears large but few nuts. A precocious variety is naturally to be preferred, other things being equal, to one that is slow in coming into bearing.

In the *Garden's Bulletin*, Straits Settlements, September 12, 1919, there is a short note on the fourteen varieties of coco-nuts which are known to exist at Singapore island. There are also given capital illustrations of these fourteen varieties together with their native names.

From four of the commonest races in the island most of the Singapore copra is made; the nut of a fifth very common variety is too small for the commercial production of copra, but is sold cheaply in the local markets for ordinary domestic use. Other less widely spread races also yield good nuts for copra making.

The nuts of the others have special uses. One variety produces little detached granules of the nutty substance in the milk—not in every nut but in 4 or 5 per cent.—and these nuts are eaten with sugar as a delicacy. Still another variety has more sugar in the milk than most coco-nuts, and for that reason is also reserved for eating. One variety produces nuts which are reserved for making medicines, as the 'meat' has a very pleasant scent.

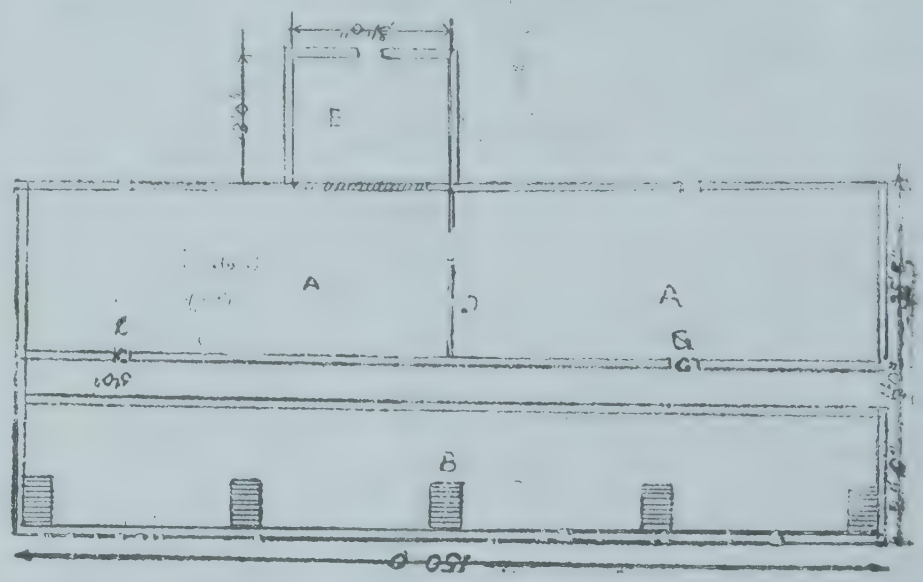
Considering the increased attention that is being paid to coco-nut cultivation in the West Indian islands, it would appear to be of importance if careful investigation could be made with regard to the races of coco-nuts available for planting purposes in these islands. Although, as was pointed out above, the varieties yielding the largest percentage per tree of copra are the most desirable for planting on a large commercial scale, it would seem that for orchard purposes some of the other varieties recorded from Singapore might very profitably be also grown for local sale.

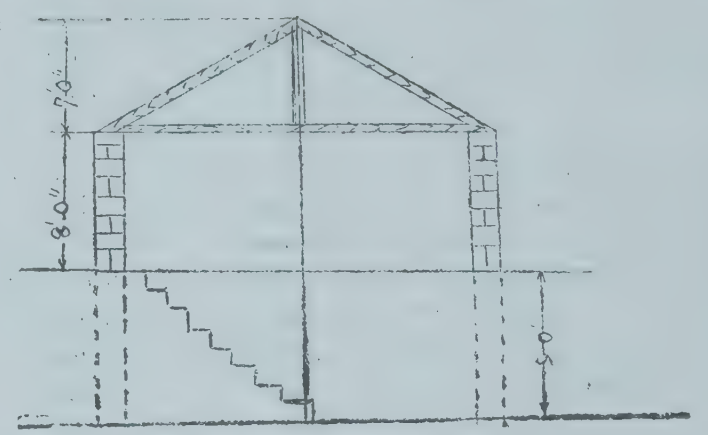
A SYSTEM OF MANURE MAKING IN MAURITIUS.

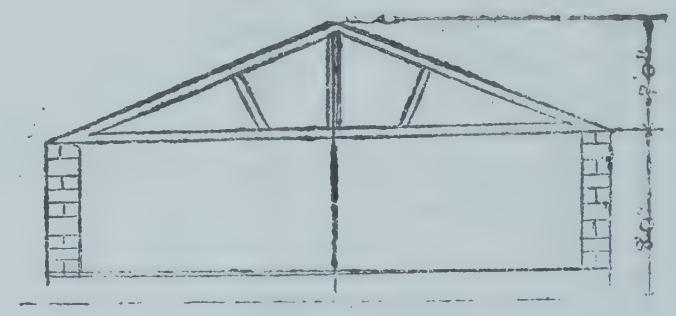
There is no more important subject in tropical agriculture than the production of organic manure, and the present article, based largely on information received through Dr. Tempany, Director of Agriculture, Mauritius, is likely to prove interesting and important. The information consists chiefly of a description of a system of turning trash and bush into farmyard manure practised on an estate in Mauritius.

'The pens marked A A are constructed of stone and floored with stone also. Nearly all constructional works on estates are made of stone here. It is covered with a roof supported on pillars, and is surrounded by a retaining wall about 5 feet high. As shown in the plan, the floor level is flush with the ground. The material with which the pen is filled is cut fine with an electrically driven chaff cutter, situated on the platform adjoining the pen and marked E. The pen is divided into two by a wooden platform marked D, the two halves being worked alternately to facilitate charging and discharging.

'The material used consists of bush, leaves, grass, cane straw—in fact all kinds of readily decomposed organic matter—and the pens are filled with this to a depth of about 2 feet. On this a herd of from thirty to fifty oxen are turned every night, and at the end of fourteen days the material is taken from A and transferred to the pit marked B through the opening marked C, and from B, shortly after, it is removed as required. This pit B is also constructed of and floored with stone; it is provided with stairways to facilitate extraction, and is covered with a roof supported on pillars as shown. Drainage from the pen is to the pit, while the pit itself is not drained.'

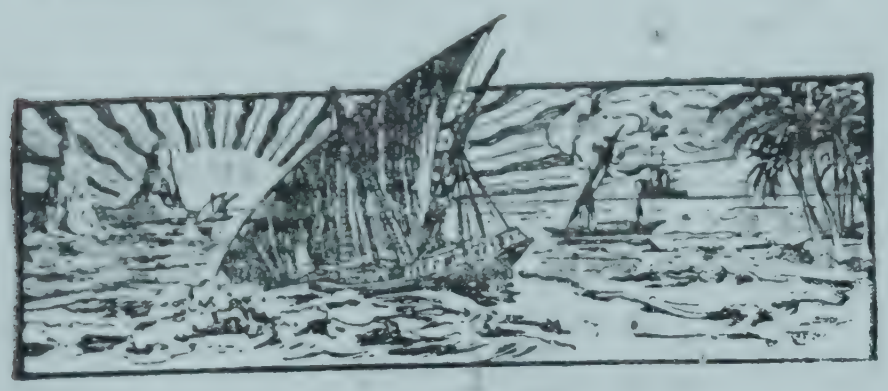






In connexion with this system, Dr. Tempany calls attention to the fact that the considerable amount of aeration causes a rather high loss of nitrogen. The use of sulphate of iron has been suggested as a means of preventing this loss, but Dr. Tempany considers it would prove too expensive, and suggests gypsum instead. In Barbados the loss of nitrogen is checked by putting layers of mould in the pens, as is done in making a compost heap. Where there is much woody matter to be decomposed, it is probable that plenty of aeration is desirable, if not absolutely necessary.

Reference to the *Agricultural News* for November 15, 1919, p. 361, will show that the newly discovered cellulose organism requires both soluble nitrogen and air. Since the work of this organism is believed to be highly important in humus production, it would obviously be better to allow plenty of aeration, and to check nitrogen loss by chemical means, as by the use of gypsum or sulphate of iron.



GLEANINGS.

Kahuku plantation, of Oahu in the Hawaiian Islands, is now turning out white sugar in an experimental way, and will probably put its product on the local market next year. The sugar is not refined, but by a new process the coloured matter is removed, leaving pure white granules. (*Facts About Sugar*, October 18, 1919.)

The progress in the campaign for tick eradication in the United States is shown by the fact that in 1918, according to the *Experiment Station Record*, July 1918, no less than 79,600 square miles of territory were released from quarantine, freeing the entire State of South Carolina, and leaving under quarantine only 269,650 square miles.

In the *Experiment Station Record*, 'Abstract Number, Vol. XLI, No. 3, a note appears to the effect that E. W. Albrecht states that a satisfactory edible oil has been made in Roumania from the seeds of a variety of pumpkin. These seeds yielded, on extraction with benzene and purification, from 40 to 42 per cent. of their dry weight in oil of greenish colour and pleasing taste.

The Agricultural Instructor for the district of East Portland, Jamaica, states that there is much improvement in the local industry of making hats from such materials as cane leaves, banana trash, grass, and coco-nut leaves. The hats made from these materials are now very much worn in the district. School children are often seen wearing hats of their own making. (The *Journal of the Jamaica Agricultural Society*, September 1919.)

A new project for the development of cane-sugar production in Florida has been set on foot by the incorporation of the United States Cane Sugar Corporation, with an authorized capital of $10,000,000. The company has already selected a tract of more than 200,000 acres west of Miami, and has entered into a contract with the owners with a view to turning out its first crop in the fall of 1921. (*Facts About Sugar*, October 11, 1919)

The *Daily Telegraph*, November 14, 1919, states that the Secretary of State for the Colonies has appointed a committee to consider whether the staff of the Agricultural Departments in the Colonial Services is adequate, and, if necessary, to recommend increases of staff; to consider whether the rates of salary offered to the agricultural staff are adequate, and if necessary, to suggest improvements; and to make recommendations for improving the arrangements for recruiting agricultural staffs for the colonies.

The aroma or smell of tea is due to an essential oil, and if it is weak, this is probably due to over-fermentation, which not only destroys the oil, but gives rise to products of decomposition which mask the smell of the oil. Strength of tea is due to the stimulating effect of the active principle (cafeine), and pungency, to the astringent taste of tannin. The leaves must be effectively dried, but if the firing is too strong, certain losses occur, and the quality is impaired. (The *Colonial Journal*, October 1919.)

The *Wealth of India*, July 1919, states that the true hemp (*Cannabis sativa*) is not grown in India for fibre, though a certain amount is cultivated, under strict supervision, for the sake of the drug it contains. Practically the whole export of Indian hemp consists of the fibre of sunn hemp (*Crotalaria juncea*). The fibre of this plant is said to make a good substitute for flax. It may be remarked that this plant is widely spread throughout the West Indies as an ornamental, and is being experimented with as a green dressing.

A special sugar committee of the Ceylon Agricultural Society has presented a report recommending the establishment of sugar cultivation on the island. It is generally admitted that there are immense possibilities of sugar production in Ceylon, either from the Palmyra palm or from the sugar-cane. Private enterprise has however lost heavily in the past, and therefore it is recommended that Government support be given by means of land cencessions, cheap loans, and experimental mills. (*The Board of Trade Journal*, November 20, 1919.)

In a report on Australian industries started or stimulated through the war, the *Weekly Bulletin*, Department of Trade and Commerce, Canada, makes the interesting statement that it has been discovered that the bark of a large variety of eucalyptus tree may be utilized for producing a fibre suitable for the manufacture of twine, rope, and bagging, of a quality equal to, and at half the cost of, the best flax and Indian jute goods. If these claims be substantiated, the commercial possibilities would be very great. The supply of raw material is practically inexhaustible and can be obtained for the mere cost of gathering and transportation to factory.

The Board of Trade Journal, October 16, 1919, reproduces a speech of Sir Auckland Geddes, President of the Board of Trade, on the prospects of British trade, from which we quote the following remark: 'There is a dreadful fallacy at present fermenting in the minds of many working men—that the less work they do, the more work will be left for others. That fallacy is one of the things which this country has to conquer. It is doing us more harm than any other erroneous belief with which I am acquainted. Linked with it is another fallacy, that when you nominally receive more money, you get better wages.'

Reports to the Forest Service, United States Department of Agriculture, from the national forests in California, where army aviators are making daily flights in search of forest fires, indicate that the innovation has been decidedly successful, and that air patrols of the forests will prove so valuable that they will eventually become a permanent part of the work to shield the great woodlands from conflagrations. Numerous fires have been discovered in their early stages by the aviators, and have been reported immediately to the forest rangers. It is believed that considerable loss has been prevented by such early discoveries. (The *Hawaiian Forester and Agriculturist*, August 1919.)

THE PRESERVATION OF PERISHABLE PRODUCTS WITH BURNT LIME.

It was pointed out in the *Agricultural News*, November 29, 1919, that fairly good results had been obtained in Antigua by storing onion seed over quick-lime. The following, quoted from the *Queensland Agricultural Journal*, February 1919, goes to show that lime may be advantageously employed in the storage of perishable agricultural products of various kinds:—

Lime is a product that is to be found on most farms, more particularly those on which dairying is engaged in. There are other purposes, not generally known to the man on the land, to which it can be put, besides making white-wash.

That it is an excellent preservative for a number of products, culinary and otherwise, has been proved by experiment. It has been tested in regard to the preservation of fruits, tubers, and grains The method adopted will be described by taking a single example from each of the above.

In the storing of various products it is essential that they should, in most instances, have reached the stage of ripeness, or maturity, and moreover, that immediately after harvesting they be allowed to undergo what is generally termed the 'sweat process.' This is the giving off of surplus water, and chemical changes may also take place to a more or less extent.

FRUIT.—ROUGH SKINNED LEMONS.

These are to be found in abundance in most districts during the cool months of the year, but in the hot summer weather they are generally not procurable. This of course is on account of their poor keeping qualities, more particularly in coastal areas, where, after picking, they will remain fresh for only a very short time.

During the past season rough-skinned lemons, which were stored in petrol tins during August, were found to be in an excellent state of preservation at Christmas. The treatment was as follows :—

When picked they were spread out in a shady, airy place for two days, then packed in partially air-slaked lime, the fruits being kept well apart. If close packing is adopted, it will probably be found necessary to repack in about a week's time, more particularly if the skins of the fruit are in a soft, fleshy condition. A wooden case may be used for storage. This can be made fairly air-tight by lining or covering with stout paper.

In a check test carried out without using lime, the lemons deteriorated very quickly

It may be mentioned that Lisbon lemons can be kept fresh for quite a long time, by packing in sand that has been thoroughly dried.

SWEET POTATOES.

It is important that the tuber, for storing should be fully matured. This is ascertained by breaking a few, and leaving them exposed to the air for about an hour. If ripe, the cut surface should remain white, or nearly the same colour as when cut. If it turns black, or greenish black, they are not mature

Sweet potatoes have been kept for six months simply packed in air-slaked lime ; being a bulky product, a test was made last season by using less lime and substituting sand, in the proportion of 1 of lime to 4 of sand. The potatoes were first rolled in lime, and packed in a wooden case (not air-tight) with the above mixture. In January they were quite as sound as when stored in August. To keep them fresh for a shorter period, roll in lime, and store in a cool, dry place.

ENGLISH POTATOES.

Judging by the number of enquiries received, difficulty is often experienced in keeping English potatoes—intended for seed—for an extended period. A cool, well-ventilated building, with a dry floor, is essential to success. The tubers should be spread out in layers (dusting with lime during the process), then covered up with either very dry sand or a mixture of sand and lime. If rotting is at all in evidence an increased amount of lime should be used. Where the potato moth is troublesome, and sand only has been used, a thin layer of lime should be spread over the top. All spaces between the tubers should of course be filled by the sand.

PRESERVING SMALL LOTS OF GRAIN FOR SEED PURPOSES.

It is well known that unless special provision has been made in the way of air-tight tanks, fumigation, etc., it is a most difficult matter on the coast to keep seeds, such as cowpea, grain sorghums, maize, etc., free from weevils.

It has been found that weevils cannot multiply in grain unless it contains a certain percentage of moisture. In wheat, for instance, there has to be at least 10 per cent. present. When harvested, it invariably contains from 6 to 7 per cent. moisture, and is therefore weevil proof.

A simple method of keeping the moisture content under weevil requirements is to use a vessel or container as air-tight as possible, such as a tank, petrol tin, old cream can, etc., and when storing seeds to include a quantity of freshly burned lime. In the event of the container not being insect proof, the bags containing the seeds should be covered right over with lime. In fact the lime can be mixed with the grain without detriment. In order to ascertain whether lime would be injurious to vitality, a number of maize cobs and grain sorghum heads were buried in partly air-slaked lime in the month of June. A vitality test was carried out in September, the maize giving 100 per cent., and the sorghums 98 per cent. germination. A further test was made at the end of December with practically similar results.

Sunn Hemp in Grenada.—Trial cuttings of Sunn hemp (*Crotalaria juncea*) were made recently at the Botanic Gardens, Grenada, in order to ascertain the value of this legume as a green dressing.

On May 23, 27 lb. of seed were broadcasted and raked in over an area of 1,500 square feet of land, which had been previously forked and hoe-ploughed, and from which the larger weeds had been removed in order to give the seedlings a fair start. The entire plot was covered in by the plants, which displayed an enormous seed vitality, and attained a height of 3 to 4 feet at the time of bloom, which commenced on or about July 4.

Bacterial nodules were prominent on the roots at the time of flowering. The weight per square yard of green and dried matter, taken at different stages of growth, was as follows :—

July 14 (green weight) 6 lb., or a calculated yield of 12·96 tons per acre.

July 29 (dry weight) 1 lb., or a calculated yield of 2·11 tons per acre.

August 20 (green weight) 9 lb., or a calculated yield of 19·44 tons per acre.

September 6 (dry weight) 2½ lb., or a calculated yield of 5·40 tons per acre.

PLANT DISEASES.

THE CACAO CANKER FUNGUS AS A CAUSE OF COCO-NUT BUD ROT.

The following summary of the results of a recent research on coco-nut bud rot in the Philippines, by Otto A. Reinking, is reproduced from the *Philippine Journal of Science*, Vol. XIV, No. 1, dated January, 1919 :—

'Enormous losses, amounting to thousands of pesos each year, are produced by coco-nut bud rot. As shown by the Bureau of Agriculture reports, the disease is most prevalent in Laguna, Tayabas, Pangasinan, and Zamboanga Provinces. It is most abundant in very humid sections and in thickly planted groves, both of which conditions are found on the slopes of Mount Banahao. Field studies show that the spread may be extremely rapid during favourable weather.

'An organism similar to *Bacillus coli*, (Escherich) Mig., and other saprophytic bacteria are associated with the disease. Under certain conditions, such as a host weakened by severe injury, the former organism and *Bacillus coli*, (Escherich) Mig., isolated from man or horse, may in inoculation experiments produce disease.

'A smmmary of the entire bacteriological work done by the present writer, including approximately 300 inoculations, has indicated that, while the bacteria are always present and are a factor in destroying the weakened tissues, they cannot account for the initiation of the disease or its prevalence and rapid spread.

'*Phytophthora faberi*, Maubl., isolated from cacao produces a typical bud rot of coco-nut seedlings and of mature coco-nut trees.

'A fungus isolated from a typical field case of coco-nut bud rot was found to be identical with *Phytophthora faberi*, Maubl, isolated from cacao.

'*Phytophthora faberi*, Maubl., isolated from the field case of coco-nut bud rot produced in all inoculated seedlings a typical infection.

'*Phytophthora faberi*, Maubl., isolated from the field case of coco-nut bud rot, produced disease in coco-nut seedlings, cacao fruit, Hevea rubber seedlings, and papaya fruit. The same species of fungus isolated from cacao fruit produced disease in coco-nut seedlings and mature trees, cacao fruit and stem, Hevea rubber seedlings and mature trees, and papaya fruit.

'A morphologic and taxonomic study of the organism isolated from coco-nut has proved that it is *Phytophthora faberi*, Maubl., as described by Rosenbaum.

'From these researches it can be stated that with certainty that *Phytophthora faberi*, Maubl., causes coco-nut bud rot; bacteria are apparently, in the majority of cases, always secondary, but are concerned with destroying the weakened tissues.'

'By proving that the fungus causing coco-nut bud rot is identical with the organism which produces black rot of cacao pods, canker of cacao, fruit rot and canker of Hevea rubber, and rot of papaya fruit, it becomes evident an entirely new series of controls will have to be devised. *Phytophthora faberi*, Maubl, may grow readily, under favourable conditions as a saprophyte also, on dead portions of cacao, coco-nut and papaya.

RECOMMENDATIONS.

'Trees when once severely infected never recover. The mode of growth of the palms and the nature of the disease make it impossible to cure trees already badly affected.

'Systematic inspection, condemning and burning of all diseased coco-nut trees, as carried on by the Bureau of Agriculture should be continued.

'All parts of diseased trees must be burned; otherwise the organism will live as a saprophyte on dead matter, and then spread to healthy trees.

'Clean cultivation ought to be practised in all groves.

'Under no circumstances should coco-nuts be interplanted with cacao or papayas.

'If coco-nuts are planted near diseased Hevea rubber, precautions should be taken to avoid the spread of the disease.

'Trees in new groves must be planted 10 metres apart each way. This spacing is one of the most satisfactory means of control against bud rot, and at the same time tends to give the highest production of nuts.'

The type of bud-rot to which the above summary refers is one which affects the central leaves and causes rotting of the heart, the older leaves remaining in a perfectly healthy condition for some months later. It is highly infectious, and most commonly attacks trees that have just come into bearing. The trunk is not affected for more than some 8 inches at the top.

Notices of Mr. Reinking's paper have already appeared in the Journals of the Agricultural Society of Trinidad and of the Board of Agriculture in British Guiana, and the announcement has naturally aroused great interest, from its possible bearing on the bud-rot problem in the West Indies.

The present reviewer when recently in Trinidad, found a tendency on the part of coco-nut planters to assume that the results obtained in the Philippines were immediately applicable to the local affection, while the British Guiana Journal in an editorial comment states : 'There is little doubt that a careful scientific investigation here will prove a similar relationship' between *Phytophthora faberi* and bud rot.

Assumptions of this kind are to be deprecated, and there are special reasons for caution in the case of bud rot. The writer has insisted from time to time on recognition of the fact that the existence of bud rot in coco-nut palms is not of itself evidence of the presence of a specific disease, or of disease at all, in the ordinary sense of the word. Bud rot is a condition which may be induced by mechanical, chemical, or parasitic interference with the life processes of the palm. The material of the 'heart' is extremely tender, and when the natural resistence of the living tissue is reduced, it affords a highly nutritive medium suitable for the rapid development of any of a large variety of possible invading organisms. In the case of epidemic or infectious bud rot, the issue is narrowed down to the responsibility of a transferable parasite, but there is no ground for assuming that the parasite concerned in producing a condition of such a general nature is necessarily or even probably the same in different situations, J. R. Johnston, now confirmed to some extent by Reinking, has put forward evidence to show that *Bacillus coli* may be effective in setting up coco-nut bud rot. The widely prevalent and destructive bud rot of palms in Southern India has been long known to be due to *Phytophthora palmivora* (*Pythium palmivorum*), and the same fungus has recently been found by S. F. Ashby in connexion with coco nut budrot in Jamaica.

The need for caution emphasized above is at the same time an indication of the need for further examination of bud rot in different parts of the West Indies, in the light of the Philippine discovery. Reinking's paper affords valuable evidence of the manner in which a fungus parasite may be masked by early bacterial infestation, and provides an interesting parallel with the history of the investigation of the same fungus in connexion with cacao pod rot.

The smaller Antillean islands afford little opportunity for research on bud rot. The cases appearing have so far been few and sporadic, and the affected trees are generally removed in haste to prevent further spread. Trinidad and British Guiana are indicated as the most suitable locations for the further work required.

W. N.

EFFECTS OF ANIMAL AND PLANT PROTEINS IN RATIONS FOR LAYING HENS.

An interesting paper on the above subject, which appeared in the Philippine Agriculturist for March 1919, draws some conclusions, which seem well worth noting by poultry keepers in the tropics.

In the first place, it must be remembered that a hen may be looked upon as a sort of living machine, which can convert raw materials into a palatable and highly finished nutritious product—the egg. It is necessary therefore for the hen to have, besides the food necessary to maintain her own bodily vigour, some extra material from which the egg may be produced.

Results of experiments as to the nature of feeds given to hens, in order to obtain a maximum egg production, seem to show that an addition of animal protein to the food of laying hens helps much to increase the egg production

In what manner animal and plant proteins added to the of laying hens affect the fertility of the egg and the vitality of the chicks is also a question of economic importance.

Many experiments have been made at various stations in the United States with regard to the above questions, in which the feeds used were principally beef-scrap, milk, oil-meal, gluten meal, and cotton seed meal. The author of the paper referred to above states that these materials are not readily obtainable in the Philippines, which is also the case as regards most of them in these West Indian islands. Accordingly, in the Philippine experiments, the animal protein was supplied in the form of snails, crushed and boiled, and the plant protein in the form of copra meal.

The experiment was conducted with two lots of twelve hens and one cock each, one lot being supplied with snails, and the other lot with copra meal in addition to a basal ration of grain and mash. At all times the fowls had access to green grass, ground charcoal, grit, and pounded oyster shells.

The experiment was conducted for a year.

The following conclusions were reached :—

1. The snail-fed hens were found to have fattened very much more than the copra meal-fed hens.

2. The hens fed with snails produced many more eggs than those fed with copra meal.

3. There was apparently no difference in effect on the fertility of the eggs produced on either ration.

4 The chicks produced from the copra meal fed lot were more vigorous than those from the snail fed lot up to the fourth week of life ; after this time, however, the chicks from the snail-fed lot began to pick up, so that their rate of growth was the same.

5. There was no observable difference in the size of the eggs produced by either lot, the average being about 39 grammes in weight.

6. Mortality was greater among the chicks from the copra-fed lot than among those from the snail-fed lot.

7. Two hens died in the copra meal fed lot, while none died in the snail-fed lot.

EFFECT OF THE MOON ON PLANTS.

In a previous issue of the *Agricultural News* a short article was published on the results of a series of experiments in France, which showed that planting crops at different phases of the moon had no appreciable effect on the yields obtained.

Experiments of a similar nature, conducted in America and elsewhere, have led to similar conclusions.

Certain notions concerning the felling of plants in relation to the moon's phases have also been dissipated in India (see *Experiment Station Record*, Vol. XVIII, p. 643).

Incidentally it may be stated that general investigations have shown that it is not possible to place any dependence upon forecasting the weather by means of the moon's phases and positions.

It is known, however, that the moon does have an effect upon barometric pressure. This has been shown by German investigations (see *Experiment Station Record*, Vol. XXII, p. 417), and by certain Greenwich and Ben Nevis studies in Great Britain.

Apparently pressure tends to be highest around the new and full moon periods (i.e. at the time of spring tides), and lowest around the periods of the quarters.

While this will no doubt influence weather conditions, other factors, such as equatorial and polar currents of air, are so much more potent, that the moon's influence can never, as far as we know at present, be used in framing meteorological prognostications.

There is, however, the interesting speculation—perhaps of more philosophic than practical concern—as to whether the changes in the moon's attractive or gravitational force have any important influence upon plant physiology and soil physics.

We should imagine it most likely for an effect to be noticed in regard to the upward movement of water in plants and in the soil. But to pass an opinion as to whether this effect is really produced, requires a knowledge of physics and astronomy.

The main causes underlying the movement of water in plant stems are, according to Palladin's 'Plant Physiology,' the transpiration from the leaves, the force of imbibition in the cell walls, and the cohesion of liquid water. The so-called root pressure, produced by osmosis, which causes bleeding in plants, is only involved to a minor extent.

The moon's maximum pulling influence at the time of spring tides should certainly tend to cause a rise in vertical columns of water, whether suspended by capillary attraction (as in the soil), or by the force of folial transpiration and cohesion (as in the stems of plants).

On the other hand, if we are to expect high barometric pressure at this period, there will be an opposite tendency produced, for evaporation is reduced by increase of gaseous pressure.

The subject as a whole is a complex one, and necessitates both mathematical and biological investigations to obtain satisfactory conclusions. It nevertheless opens up interesting speculations.

The daily measurement of the height of columns of water in capillary tubes placed under constant barometric pressure and corrected for temperature changes, might indicate some correlation with the change in the moon's force of attraction. Such a correlation, if it occurs, would be more readily noticed in northern than in tropical latitudes.

MARKET REPORTS.

London.—The West India Committee Circular, October 16.

Balata—Venezuelan Block, no quotations ; West Indian Sheet, no quotations.
Beeswax—No quotations.
Cacao—Trinidad, 125*s.* to 126*s.*; Grenada, 118*s.* to 126*s.*; Jamaica, St. Lucia, St. Vincent, and Dominica, no quotations.
Copra—£55.
Honey—Jamaica, 72*s.* 6*d.* to 90*s.*
Lime Juice—Raw, 2*s.* 3*d.* and 2*s.* 6*d* ; Concentrated, no quotations.
Pimento—5½*d.*
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.

Barbados—Messrs. T S. Garraway & Co., December 9.

Arrowroot—$9·00 per 100 lb.
Cacao—$20·00 per 100 lb.
Coco-nuts—$45·00 husked nuts.
Hay—$4·50 to $4·75 per 100 lb.
Onions—$16·00.
Peas, Split—No quotations; Canada, Market bare.
Potatoes—$4·25 per barrel
Sugar—Market bare.

London.—The Perfumery and Essential Oil Record, October 21, 1919.

Bay Oil—16*s.* to 18*s.*
Lime Oil—Flat, at 3*s.* 9*d.* to 4*s.* for West Indian distilled, and 11*s.* for hand-pressed.
Orange Oil—West Indian sweet, 8*s.* 6*d.* to 9*s.* ; bitter, 9*s.* to 10*s.*

Trinidad.—Messrs. Gordon, Grant & Co., November 5

Cacao—Venezuelan, $26·00 ; Trinidad, $25·00 to $26·00.
Coco-nut Oil—$1·65 per gallon.
Coffee—Venezuelan, 26c. per lb..
Copra—8c. to 8½c. per lb.
Dhal—$10·25.
Onions—$10·00 per 100 lb.
Peas, Split—$9·00 per bag.
Potatoes—English, $4·00 to $4·50 per 100 lb.
Rice—Yellow, $12·00; to $13·00 White, $12·00 per bag.
Sugar—American crushed, no quotations.

New York.—Messrs. Gillespie Bros. & Co., November 19.

Cacao—Caracas, 24½c. ; Grenada, 23c. to 23½c. ; Trinidad, 23¼c. to 23¾c.; Jamaica, 19c.
Coco-nuts—Jamaica selects, $80·00; Trinidad $80·00; culls, Jamaica, $56·00 ; Trinidad $56·00 per M.
Coffee—Jamaica, 22½c. to 25c. per lb.
Ginger—23c. to 27c. per lb.
Goat Skins—Jamaica $1·70; Antigua and Barbados, $1·65; St. Thomas and St. Kitts, $1·40.
Grape Fruit—Jamaica, $2·00 to $3·00.
Limes—No market.
Mace—40½c. per lb.
Nutmegs—21c.
Oranges—$2·50 to $3·25.
Pimento—9¾c. per lb.
Sugar—Centrifugals, 96°, No market ; Muscovados, 89°, No market ; Molasses, 89°, No market.

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West India Committee, 15, Seething Lane.
Barbados : Advocate Co., Ltd., Broad Street, Bridgetown.
Jamaica : The Educational Supply Company, 16, King Street, Kingston.
British Guiana : The Argosy Co., Ltd., Georgetown.
Trinidad: Messrs. Muir-Marshall & Co., Port-of-Spain.
Tobago: Mr. C. L. Plagemann, Scarborough.
Bahamas: Mr. H. G. Christie, Board of Agriculture, Nassau.
Grenada: Messrs. Thos. Lawlor & Co., St. George.
St. Vincent: Mr. J. D. Bonadie, 'Times' Office.
St. Lucia: Mr. R. W. Niles, Botanic Station.
Dominica: Mr. J. R. H. Bridgewater, Roseau.
Montserrat: Mr. W. Robson, Botanic Station.
Antigua: Mr. S. D. Malone, St. John's.
St. Kitts: The Bible and Book Supply Agency, Basseterre.
Nevis: Mr. W. I. Howell, Experiment Station.
Canada: Lewis W. Clemens, 801, Yonge Street, Toronto.

INDEX.

A.

Abies douglasii (Douglas fir, or Oregon pine), 329, 342.
Acacia farnesiana, 41.
— seeds, vitality of, 41.
Acridity in tannias and eddoes, cause of, 57.
Advertisement, the first, 239.
Aerial mail service, Indo-Burma, 335
Aeroplane, use of, for purposes of surveying, 265.
Afforestation in the United Kingdom, 28.
Agave (*Agave sisalana*), 35, 106, 196, 253.
— americana, 396.
— fourcroydes (henequen), 106, 220.
— rigida, var. elongata, 268.
— —, — sisalana, 268.
Agouti, or Indian cony (*Dasyproctor Agouti*), 325.
Agricultural College, Porto Rico, 366.
— costing, 271.
— Credit Societies in St. Lucia, 246.
— — — — Trinidad, 249.
— Department and Board of Agriculture, Trinidad, reorganization of, 47.
— —, Grenada, 135.
— examinations, 1918, 175, 179.
— History Society, establishment of, 332.
— inspection in Grenada, 367.
— instruction in Grenada, 223.
'Agricultural News,' Vol. XVII, Index to, 168.
Agricultural outlook in Montserrat, 221.
— reorganization in Trinidad, 393.
— schools, organization of in Hayti Nicaragua and Mexico, 408.
— show, local, 408.
Agriculture in Barbados, 7, 23, 43, 55, 75, 87, 111, 127, 133, 149, 167, 187, 197, 212, 231, 263, 286, 357, 383, 388, 404.
— — Nevis, 55.
—, proposed temple of, 239.
Alcohol, colonially produced, British surtax on, 120.
—, industrial, demand for in United Kingdom, 101.
— in Canada, 137.
— made from molasses, 84.
— production in Cuba, 117.
Aleurites] Algaroba, (*Prosopis juliflora*), 164.
Aleurites oil,] 396.
Almond (*Terminalia catappa*), 26.
America, farm tractors in, 9.
American manatee (*Manatus latirostris*), 181.
Ammonium nitrate as a fertilizer, 121.
Amrat Mahal cattle, 295.
Anderson oil expeller in the Federated Malay States, 255.
Andropogon auctus (tamboukie grasses), 39.
— Buchananii (thatching grass or 'dek gras'), 39.
— Dregeamus (tamboukie grasses), 39.
— halepensis, 29.
— Sorghum (Guinea corn), 151.
Animals, wild, 325.
Ankylostomiasis, campaign against, 76, 239.
—, treatment of by oil of chenopodium, 71.
Annatto on the London market, 143, 191, 223, 253, 303, 335, 367.
Anona squamoso (sweet sop), 26.
Anthelminties, or worm destroyers, 220.
Antigua and St. Kitts sugar factories, sucrose content of canes crushed at, 116.
—, close season cotton Ordinance in, 277.
—, hill rice in, 277.
—, items of local interest, 22, 75, 87, 127, 167, 196, 253, 286, 308, 324 382, 404.
—, live stock in, health of, 276.
—, plant legislation in, 105.
—, plants poisonous to stock in, 168.
—, private land settlement in, 328.
—, rainfall in, 183.
—, sisal cultivation in, 220, 277.
—, sugar factory in, 36.
—, weather in, 389.
Antiseptics, injection of, into diseased trees, 373.
Aphelenchus cocophilus, 376, 398.
Arrowroot on the London market, 95, 123, 143, 191. 253, 303, 367, 399,
Ascaris lumbricoides, 238.
Atmospheric disturbances, recent, 264.
Australian wines, 11.
Avocado, another species of, 219.
— pear (*Persea gratissima*), 202.

B.

Back to the land and countryside, 121.
Bacon and hams, home-curing of, 27.
—, curing on the farm, 284.
Bacteria, the nature of, 78.
Bahamas, marine enterprise at the, 233.
—, pine-apples and tomatoes in, 147.
Ballou, H. A., 246, 293.
Bamboo paper pulp manufacture in Trinidad, 220.
Banana cider, 366.
— industry, dried, 276.
— stalks, utilization of, 201.
Bananas, depth to plant, 380.
—, record shipment of, from Jamaica, 172.
Barbados, a forthcoming local exhibition in, 361.
—, agriculture in, 7, 23, 43, 55, 75, 87, 111, 127, 133, 149, 167, 187, 197, 212, 231, 263, 286, 357, 383, 388, 404.
—, area of Sea Island cotton grown in 1918, 28.
— blackbird (*Quiscalus fortirostis*), 262.
—, close season for cotton in, 105
—, land values in, 124.
—, oil prospecting in, 348.
—, tractor demonstratoin in, 301.
Barber, Dr. C. A., 152.
Barbuda, items of local interest, 212, 263,
—, phosphate in, 136.
Bauxite deposits of British Guiana, 284.
Bay tree (*Pimenta acris*), 199, 350
Bean dish, a new, 387.
Beans, production in Brazil, 124.
Bee keeping—a possible help to cotton growers, 5.
Beet sugar industry, European, present position of, 99.
Bengal, date palm sugar industry in, 79.
Bermuda grass (*Cynodon dactylon*), eradication of, 279.
Bertholetia excelsa (Brazil nut), 283.
Bête rouge, 315.
Bidens coreopsides, 169.
— leucanthus, 169.
Birds, insect-eating, in St. Vincent, protection of, 15.
Board of Trade, Trinidad, 281.
Books Reviewed :—
An Outline of the History of Phytopathology, Whetzel, 292.
A Practical Guide to Tropical Agriculture, Fasschere, 316.
Blackies Senior Tropical Reader, Watts and Branch, 71.

Books reviewed—*Continued* :—
Control of hookworm disease by the intensive method, Howard, 238.
Equipment for the Farm and Farm stead, Ramsower, 119.
Fundamentals of Botany, Gages, 292.
Nature Teaching, Watts, 159.
Plant Physiology, Palladin, 292.
Text-book of Chemistry, Wickham and Scott, 54.
Bonavist (*Dolichos Lablab*), 298.
Botanic Garden at Havana, 251.
Botany, fundamentals of, 334
Bunea macrophylla, 329.
Bougainvillaea glabra, 105.
— spectabilis, 105.
Brazil, bean production in, 124.
—, cotton cultivation in, 63.
—, jute cultivation in, prospects of, 246.
— nut (*Bertholetia excelsa*), 280.
Bridgetown, port of, 313.
Brimstone tree of Sierra Leone, 248.
Britain's falling exports, 280,
British Cotton Growing Association, 249.
— cotton growing, further development in regard to, 6.
— East Africa, sisal cultivation in, 35.
— Empire, cacao production in, 267.
— —, cultivation in, 173.
— Guiana, bauxite deposits of, 284.
— —, cattle grazing in, 379.
— —, — raising in, 13.
— —, developing, 296.
— —, exports from, 323.
— —, flour factory in, 371.
— —, health week in, 181.
— —, human mortality in, 366.
— —, rubber cultivation in, 135
— —, sanitation in, 60.
— —, sugar-cane varieties under cultivation in 1918, 315.
— Honduras, timber industry of, 172.
— molasses company, 377.
— surtax on colonially produced alcohol, 120.
— Virgin Islands, sponges from, 313.
— West Indies, imports of unrefined sugar from into the United Kingdom in 1918, 316.
Bufo marinus or B. Agua (the toad), 361, 378.
Butter fruit tree (*Diospyros discolor*), 329.

C.

Cacao at Havre, 383.
— bean husks, utilization of, 92.
—, criollo, 249.
—, —, disappearing, 244.
— experiments in Trinidad, 87.
— growers and the cocoa manufacturer, 228.
— in Dominica, 327.
— on the Gold Coast, behaviour of, 245.
— pods, opening, 191.
— production in the British Empire, 267.
— —, science in, 141.
Cadets, agricultural, in Grenada, work of, 390.
Cajanus indicus (pigeon pea), 165, 298.
Calophyllum Calaba (ocuje), 251.
Camels, draught, 295.
Camphor (*Cinnamomum Camphora* var *glaucescens*), 196.
—, cultivation in the British Empire, 173.
— — — Florida, 67.
— seeds, germination of, 380, 405.
— trees in the West Indies, 196.
— — — — — — —, a correction, 40
Canada, industrial alcohol in, 137.
Canada-West Indian trade, 392.
Canadian trade prosperity, 297.
— West-Indo trade, 316.
Canavalia ensiformis (horse bean), 110, 119, 165, 298.
— — (sword bean), 55, 165, 298.
Cane-sugar industry, rise and progress of, 213.
Cane versus beet sugar, 312.
Carica papaya (papaw), 202, 205.
Carludovica palmata (Jippi-Jappa), 359.
Caryocar nuciferum (Suwarri nut), 283.
Cashew nuts on the London market, 143, 223, 303, 367.
Cassava experiments in Trinidad, 109, 126.
—, sodium nitrate as a manure for, 316.
Casimiro edulis (Mexican apple), 110 228.
Cassia Fistula on the London market, 15, 143, 253, 303, 335, 399.
Castilloa rubber, 335.
Casuarina quisetifolia, 51, 393.
— glauca, 393.
— quadrivalis, 393.
— stricta, 393.
— woods in Mauritius, 51.
Cattle, Amrat Mahal, 295.
—, grazing in British Guiana, 379.
—, plantain stalks as fodder for, 403.
— raising in British Guiana, 13.
Centrosema Plumieri, 165.
Ceylon, tea cultivation in, 44.
Chenopodium ambrosioides, 71, 152.
— anthelminticum, 152
China, pine-apple cloth as made in, 377.
Chlorosis of sugar-cane, 68.
Chrysophyllum cainito (star-apple), 164.
Chrysothamnus nauseosus (Sierra rubber), 131.
Cider, banana, 366.
Cinnamomum Camphora (the Camphor tree), 385.
— Camphora, var glaucescens (Camphor), 196, 386.
Citric acid on the London market, 15, 61, 95, 123, 143, 191, 223, 253, 303, 367, 399.
Citronella (*Murraya* [*Chalcas*] *exotica*), 142.
Citrus aurantium (orange), 172.
— canker, susceptibility of norutaceous plant to, 200.
— decumana (Pampoemousse tree), 380.
— — (pomelo), 172.
— medica (lemon), 172.
— trees, pruning, 93.
Clidemia hirta, a noxious weed in Fiji, 137.
— — (Koster's cure), 269.
Coal, cost and price of, 280.
— products, wastage of, 343.
Cocoloba uvifera (seaside grape), 332.
Coco nut cultivation in Travancore, 342.
— in Zanzibar, 60.
— fibre factories, 214.
— high nutritive value of, 284.
— husks, potassic value of, 124.
— industries of Trinidad, 163.
— oil, shipping in bulk, 309.
— palm, races of, 410.
— products in the Philippines, 150.
— seed selection, 380.
Coco-nuts in Dominica, 327.
— in Nevis, 259.
Coffee, toxic principles of, 41.
Coir fibre machinery, 291.
— mechanical properties of, 311.
Colonial credit societies, position of, 318, 397.
Combustion, spontaneous, 269.
Community cotton production, 86.
Concrete roads, advantages of, 172.
Copper spray coatings, how to test, 251.
Cordia interrupta, 298.
Cork wood (*Ochroma lagopus*), 202.
Corn and sword beans as stock feed, 55.
— husk, protection for, 59
—, Guinea, as a fodder crop, 103.
—, —, hydrocyanic acid content of, 151.
—, Indian, in St. Vincent, 237.
Cosmos laudatus, 184.
— sulphurens, 184,
Cost of production in the sugar industry, 248.
Cotton, acreage in St. Vincent, 7.
—, American, 331.
—, Antigua and St. Kitts, 24.
— bush, manurial value of, 358
—, close season for in Nevis, 88.
—, — — Ordinance in Antigua, 277.
—, community production of, 310.
— conference, the world, 344.
— crop in Montserrat, 134.
— — — St. Vincent, past season's, 230.
— cultivation in India, 236.
— — — Southern Brazil, 63.
—, Egyptian, 102.
—, —, maintenance of quality of, 21.
— exports from the West Indies, 103, 168, 234, 374.
— factory, Tortola, 333.
— fibre, residual, 406.
— germination results, 318.
— ginneryat St. Vincent, 88.

Cotton growing, British, further development in regard to, 6.
— — in Venezuela, 150.
— in Barbados, close season for, 105.
— industry museum, 332.
— legislation in St. Vincent, 38.
— market, Sea Island, 6, 21, 38, 54, 70, 86, 102, 118, 134, 150, 166, 198 230, 326, 374, 390, 406.
—, Meade, 294.
— Ordinance in Turks and Caicos Islands, 121.
— pests in Montserrat, 182.
— planting: two plants versus one plant per hole, 70.
— production, 377.
— —, community, 86.
— —, Sea Island, in the West Indies, 39.
—, relation of lint length to rainfall, 73.
—, Sea Island, area grown in Barbados in 1918, 28.
—, — —, improvement of yield in the West Indies, 125.
—, — —, origin of, 326, 390, 407.
—, — —. project, 374.
— seed by products, 214,
— — distribution in Egypt, 38.
— — meal and potash 278.
— — products, comparative toxicity of, 31.
—, shipping, at Montserrat, 310
— stainer control, mahoe cochon, (*Sterculea carthea*), in relation to, 154, 155.
— stainers in Montserrat, destruction of food plants of, 153.
— standards, official, of the United States. 198.
— St. Vincent, 9,
— trade in Manchester, 403.
—, upland variety, a remarkable, 72.
—, West Indian, 260. 278.
Cowpea, inheritance in, notes on, 4, 20, 68.
— preservation, 303.
Credit societies, colonial, position of, 318,
—, —, deposit system for, 299.
—, —, Trinidad, address to, 285
Criollo, cacao, 249.
—, disappearing 244,
Crop yields effects of liming on, 41.
Crops, electrical stimulation of, 272.
Crotalaria juncea (sunn hemp), 165, 340, 412,
— usamarcensis, 135 165.
Cuba, alcohol production in, 117.
—, farm schools in, 219.
—, foreign trade and sugar crop of, 43.
—, pine-apple culture in, 311.
— sugar cane corporation in, annual report for 1918, 41.
Cuban export committee for sugar, 89.
— manganese mines, 316.
— sugar industry, past and present, 148.
Cultivating, the value of, 317.
Cymb pogon Nardus, var. validus (tambookie grass), 39
Cymodocea manatorum, 181.
nodosa (water weed), 181.
Cynodon dactylon (Bermuda grass), eradication of, 279.
Cytisus pallidus (Gacia blanca), 9,
— stenopotalus (Gacia), 9.

D.

Dasyproctor Agouti (agouti), 325.
Date palm, propagation and culture of, 252.
—sugar industry in Bengal, 76,
Death of Mrs. J. A Hutton, 89.
Degrees Centrigade and Fahrenheit, new rule for converting, 236.
Demerara lime juice and rice factory, 310.
—, rice situation in, 285.
Department News, 3, 19, 37, 53, 70, 131, 151, 183, 195, 246, 293, 335, 357, 379, 397.
Departmental Reports:—
Antigua: Report on the Agricultural Department, 1917-18, 382.
Barbados: Report on the sugar cane experiments, 1916-18, 14.
British Guiana: Report on the Department of Science and Agriculture for the year 1917, 234.
British Virgin Islands: Report on the Agricultural Department, 1918-19, 350.
Department of Agriculture, Trinidad and Tobago: Administration Report, 333.
Dominica: Report on the Agricultural Department, 1916-17. 110; 1918-19, 350.
Mauritius: Report on the Department of Agriculture, 79.
Monsterrat: Report on the Agricultural Department, 1917-18, 198.
Nyasaland Protectorate: Report on the Department of Agriculture, 1918, 85.
St. Kitts-Nevis: Report on the Agricultural Department, 1917-18, 270
St. Vincent: Report on the Agricultural Department, 1917-18, 45.
Seychelles: Annual Report on Agriculture and Crown Lands, 1917, 164.
Sugar-cane Experiments in the Leeward Islands 1916-17 and 1917-18, 372.
Departmental Reports—(*Continued.*)
Tortola: Report on the Agricultural Department, 1917-18, 132.
Deposit system for credit societies, 299.
Desmodium leiocarpum (horse marmalade), 325.
— tortuosum, 325.
Diamonds, discovery of, in the Gold Coast, 364.
—, in German South West Africa, yield of in 1913, 236.
Didelphis Nudicavdata (manicou), 325.
Digger pine (*Pinus Sabiniana*), 300.
Diospyros discolor (Butter fruit tree), 329.
Dipterix odorata, 110.
Divi-divi (*Lcbidibia coriaria*), 204.
Diseases, venereal and other, 317.
Dog, accident to, with a fruit case, 363.
Dolichos Hosei (Sarawak bean), 72, 73, 88.
— Lablab (bonavist), 298.
Dominica, cacao and coco-nuts in, 327,
— fishing company, proposed formation of, 348.
—, Gardens, new plants at the, 283.
—, items of local interest, 22, 74, 86, 126, 166, 196, 231, 262, 308, 340, 388.
—, lime cultivation in, 100, 118, 142, 158, 165.
—, onion growing in, 91, 136, 319.
—, rainfall in 1918, 104.
— report, 1918-19, 323.
—, plant legislation in, 292.
Douglas fir, or Oregon pine (*Abies douglasii*), 329, 342.
Draught camels, 295.
Dried-banana industry, A, 276.
Dryobalanops aromatica, 386.
— Camphora 386.
'Duku' (*Landium domesticum*), 329.
Dunlop, W. R., 195, 397.
Duranta Plumieri, 105.
Dwarf bucare (*Erythrina coralloden-dron*), 245.
Dycoteles Torquatus (peccary), 325.
Dyewood and chemical factory in Jamaica, 348.

E.

East Africa Protectorate, sisal cultivation in, 220.
Editorials:—
A broader mycology, 113, 129.
Advances in cotton production, 97.
Agriculture and the future, 17.
Aircraft services, 273.
Camphor, 385.
Co operation among agricultural workers, 1.
Decline in sugar content of centrifugal factory canes. 241.

Edl erials—(*Continued,*)
Empire botany, 369.
Estate costing, 225.
Land settlement for demobilized officers in the West Indies, 209.
Materials for a policy of agricultural education 177.
Oil and agriculture in the West Indies, 193.
Other aspects of plant pathology, 145.
Pure and appllied science, 401.
Retrospection, 161.
Salt and the growtn of coastland plants, 231.
Some aspects of labour supply in the tropics, 337.
Sweet potato experiments, 305.
The action of moulds in the soil, 34.
The mischief of wrong theories, 289.
The status of agricultural officers, 257.
The West Indian fish supplies, 353.
The work of the future, 49, 65, 81.
Egg preservative, a new, 345.
— plant (*Solanum melongena*), 61.
Eggs how to preserve, 351.
Egypt, cotton seed distribution in, 38,
—, sugar-cane cultivation in, 156.
Egyptian cotton, 102.
Eichornia crassipes (water hyacinth), 92
Elaeis guineensis (oil palm), 164, 380.
Electrical treatment of seeds, 367.
— stimulation of crops, 252.
Engine, combustion and steam combined, 278.
English Chamber of Horticulture, 153.
Ensilage chute, a novel, 364.
— in Jamaica, 343.
'Entomology', 330.
Epidemic, a curious local, 47.
Equus burchelli, 25.
— grevyi, 25.
— zebra, 25.
Eriodendron anfractuosum (silk-cotton tree), 45, 155, 202.
Erythrina corallodendron (dwarf bucare), 245.
Exhibition in Barbados, 361.
Exports from British Guiana, 323.
— — St. Lucia, 359.
— of Trinidad, 315.

F.

Farm tractors in America, 9.
— schools in Cuba, 219.
Farming costs, 271.
Federated Malay States, Anderson oil expeller in the, 255.
Feijoa Sellowiana (pine-apple guava tree), 110.
Fibre, a durable, 257.
—, cane, mechanical properties of, 311.
Ficus elastica, 202.
Fiji, Clidemia hirta, a noxious weed in, 137.
Fish, a useful little, 8.
—, method of curing in the Turks Islands, 229.
— skin leather, 409.
—, the sucking, 375.
Fisherman-fish (*Remora* sp.,) 293, 408.
Fishing industry, co-operative society for improving, 363.
Fishlock, W. C. 227, 284.
Flagstaff at Kew, 329.
Florida, camphor cultivation in, 67.
Flour factory in British Guiana, 371.
Fog moisture, precipitation of by trees, 134.
Food production, war-time in, St. Lucia. 213.
— requirements of man, 216.
Foods, value of certain, 216
Forage plant, a solanaceous, 235.
Forestry in Trinidad, 291.
Formaldehyde gas as a seed disinfectant, 252.
Fowls, bare-necked, 345.
—, drinking fountain for, 380.
Frangi-pani (*Plumieria* spp ,) 147.
Freeman, W. G., 285.
Frost Heury W. & Co., 6, 21, 38, 54, 70, 86, 102, 118, 134, 150, 166, 198, 230, 326 ,374 390, 406.
Fruit culture in Malaya, 329.
— picker, a simple home-made, 124.

G.

Gacia (*Cytisus stenopetalus*), 9.
— blanca (*Cytisus pallidus*), 9.
— plants from Teneriffe, 9.
Gambusia affinis ('top minnows'), 8, 9.
Carcinia mangostana (mangosteen), 164,
Gasolene exports from Trinidad, 268.
— imports into Great Brtain, 380.
German South-West Africa, yield of diamonds in, 236.
— sugar prospects, 402.
Germany, sugar cultivation in, 211.
Ginger (*Zingiber officinale*), 73.
—on the London market, 15, 95, 123, 143, 191, 223, 253, 303, 335, 367, 399.
—, wild, 73.
Girardinus poeciloides ('million'), 8, 9.
Girls, industrial instruction for, 334.
Gliricidia maculata, 100, 101, 119.
Glycerine from sugar, 89.
Gold Coast, behaviour of cacao on the, 245.
— —, discovery of diamonds in, 364.
Gossypium barbadense, 407.
— brasiliense, 407.
— peruvianum, 130.
— spp., 155.
Gossypium vitifolium, 130, 407.
Government cotton ginnery at St. Vincent, 88.
Grafting, a new method of, 252.
Grain sorghums, 29.
—, stored, protection of from insect attacks, 202.
Granadilla (*Passiflora quadrangularis*, 164.
Granary, St. Vincent, 231.
Grasses, South African, for paper making, 39.
— in the West Indies, 220.
Great Britain, gasolene imported into, 380.
Grenada Agricultural Department, 135.
—, agricultural inspection in, 367.
—, — instruction in, 223.
—, items of local interest, 22, 86, 111, 150, 212, 340, 382, 404.
—, onion growing in, 374.
—, plant legislation in, 136, 169.
—, sunn hemp (*Crotalaria juncea*) in, 413
—, white seeded Lima bean in, 229.
—, work of agricultural cadets in, 390.
Ground nut flour as human food, 132.
Guadeloupe, sugar industry in, 84.
—, ticks in, 155.
Guango (*Pithecolobium Saman*), 164.
Guinea corn as a fodder crop, 103.
Gymnema silvestre, 77.

H.

Hainan, rubber cultivation in, 409.
Haitian American Corporation, 316.
Halophytes, 321-23.
Hand plough, Mates interchangeable, 316.
Harland, Dr S. C., 4, 20, 246, 293.
Hat making industry in Tobago, 172.
Havana, Botanic Garden at, 251.
Havre, cacao at, 383.
Hawaii, industrial development of, 299.
—, sugar by-products in, 52.
—, training in sugar technology in, 261.
Health week in British Guiana, 181.
Heat production in plants, causes and conditions of, 283.
Hedge plants, desirable, 105.
Henequen (*Agave fourcroydes*), 106, 220.
Hens, laying, effects of animal and plant proteins in rations for, 415.
Hevea brasiliensis (Para rubber), 202, 364.
— —, variation in, 381.
— confusa, 364.
— new facts concerning, 358.
— rubber, effect of lightning on, 309.
— seeds, packing, 93.
Hibiscus sabdariffa (roselle), 201.
Hogcholera, 264.

Hog dolosseselining, 279.
— plum (*Spondias lutea*), 202.
Hookworm campaign in the West Indies, 233.
— disease, thymol versus chenopodium for treatment of, 238.
Honduras tobacco trade, 44.
Horse bean (*Canavalia ensiformis*), 110, 119, 165, 298.
— marmalade (*Desmodium leiocarpum*), 325.
Horse radish tree (*Moringa pterygosperma*), 164.
Human mortality in British Guiana, 366.
Hurricane warnings, 180.
Husk protection for corn, 59.
Hutson, Dr. J. C., 3.
Hutton, Mrs. J. A., death of, 89.

I

Imperial Department Publications, 376.
— — for Scientific and Industrial Research, report on, 393.
— preference, 185.
Implemental tillage and motor ploughing, a note on, 157.
Index to the 'Agricultural News.' Vol. XVII, 168.
India, cotton cultivation in, 236.
—, rubber exports from, in 1917-18, 220.
Indian corn in St. Vincent, 237.
Indigo of Nigeria, its value as a dye, 267.
Indo-Burma aerial mail service, 335.
Industrial development of Hawaii, 299.
— instruction for girls, 334,
Industries of the Turks and Caicos Islands, 59.
Industry, changes in modern methods of, 153.
Infantile mortality, 182
Infusorial earth as a fertilizer, 171.
Inga laurina (pois doux), 100.
Insect Notes :—
An outbreak of field crickets, 11.
Cacao thrips in Grenada, 122.
Clytus devastator, a new pest of the Florida orange, 11.
Cockroach control, 11.
Connexion of skin diseases in cattle with ticks, 106.
Control of the onion thrips, 314.
Control of ear ticks, 363.
Cotton Stainer in St. Vincent, 278.
Entomology in Jamaica, 10.
Entomology in Porto Rico, 36 2.
Food of Tiphia and Campsomeris, 298.
Insect pests in British Guiana, 346
Insects attracted by smoke, 298.
Living insects by post, 187.
Locusts in British Guiana, 394.
Miscellaneous insects, 74.
Insect Notes (*Continued*) :—
Nematode, a new, causing parasitic gastritis in calves, 278
Notes on some insect pests in Costa Rica, 250.
Outbreak of field crickets, 11.
Poisoning of the boll weevil, 122.
Popular entomology, 330. lady-birds,
Protection against weevil in corn, 314.
Slugs (*Veronicella occidentalis*), 281.
Some insect pests of tropical crops, 90.
Spread of the Mexican boll weevil in the United States, 234.
Sugar-cane and hard back grubs in Antigua, 218.
Suggestions for mosquito control, 42, 58.
Summary of entomological information, 1919, 394, 410.
The toad in the West Indies, 378
Tick destruction, 27.
Insect Parasites and Predators :—
Coelichneumon serricornis, 74
Canthon violaceus, 362.
Lady-birds, 330.
Novius cardinalis, 90, 330.
Scolia oryctophaga, 79.
Insect Pests :—
Acrobat ant (*Cremastogaster* sp.), 91.
Alabama argillacea (cotton caterpillar), 146, 170.
Aleurocanthus woglumi (citrus white fly), 30, 250
Amblyomma variegatum (gold tick), 106.
Anasa scorbutica, 74
Angoumois grain moth (*Sitotroga cerealella*). 77.
Arrhinotermes simplex, 26.
Anthonomus grandis (cotton boll weevil), 90.
Apate submedia, 26.
— terebrans, 26.
Araecerus fasticulatus, 74.
Argentine ant (*Iridomyrmex humilis*) 91.
Aspidiotus hartii (yam scale), 10.
— pimentae, 26.
Augochlora antialans, 74.
Australian lady-bird (*Novius cardinalis*) 90, 330.
Batocera rubus (mango tree borer), 200, 202, 383
Bean weevil (*Bruchus obtectus*), 266.
Bean and pea weevils, 266, 282.
Bephrata cubensis, 26.
Black-headed moth borer (*Diatraea saccharalis*,), 346.
Black hard backs (*Dyscinetus trachypygus*), 363.
— weevil borer of banana (*Cosmopolites sordidus*), 250.
Blatta germanica, 11.
— orientals, 11.
Boll worm (*Heliothis obsoleta*), 10.
Insect Pests (*Continued*) :—
Brown hard back (*Phytalus smithi*), 14, 79, 218.
— shield scale (*Saissetia hemisphaerica*), 362.
Bruchus chinensis (cowpea weevil,) 266.
— obtectus (bean weevil) 266.
— phaseoli, 10.
— pisorum (pea weevil), 266.
— quadrimaculatus, 10, 266.
Buck moth (*Hemileuca lucina*, var. *latifasciata*), 298.
Cacao bark-sapper (*Salbergella* sp.), 114.
California red scale (*Chrysomphalus aurantii*) 362.
Caryoborus gonagra, 26.
Castnia licus (large moth borer), 346.
Ceratitis capitata, 26.
Chinch bug, 154.
Chrysobothris tranquebarica (mangrove borer) attacking Casurina, 282.
Chrysomphalus aurantii (California red scale), 362.
Citrus purple scale (*Lepidosaphes beckii*), 362.
Clytus devastator, 395.
Contarinia gossypii (flower-bud maggot), 146.
Corn ear worm (*Laphygma frugipesda*), 10, 147.
Cosmopolites sordidus, 26, 250.
Cotton boll weevil (*Anthonomus grandis*), 90.
— — worm (*Heliothis obsoleta*) 147.
— caterpillar (*Alabama argillacea* 146, 170.
Cotton stainer (*Dysdercus andreae*), 43.
— — (*Dysdercus delauneyi*), 15, 43.
— — (*Dysdercus* spp.), 146.
Cottony cushion scale (*Icerya purchasi*), 330.
Cowpea weevil (*Bruchus chinensis*), 266.
Cremastogaster sp. (acrobat ant), 91.
Cryptococcus farciminosus (Preis Noccard bacillus), 106.
Cylas formicarius (sweet potato weevil), 10.
Diaphania nitidalis, 26.
Diaprepes abbreviatus (root borer of sugar-cane), 14, 132, 330.
Diatraea canella (yellow headed moth borer), 346.
— Saccharalis (sugar-cane moth borer), 146, 346.
Dyscinetus bidentatus (hard back), 346.
— trachypygus (black hard back), 363
Dysdercus andreae (cotton stainer), 43.
— delauneyi (cotton stainer), 15, 43.
spp. (cotton stainers) 146.

Insect Pests (*Continued*) :—
Edessa meditabunda (plant-sucking bug), 346.
Elasmopalpus lignosellus (smaller small moth borer), 346.
Eutermes morio (wood-ant), 362.
Euthisonotia amaryllidis, 147.
Eriophyes gossypii, 395.
Euchenopa auropicta, 74
European corn borer (*Pyrausta nubialis*), 186.
Euscepes batatæ. 10.
— porcellus, 10
Flower-bud maggto (*Contarinia gossypii* 146
Four-spotted bean weevil (*Bruchus quadrimaculatus*), 266.
Froghopper (*Tomaspis flavilatera*), 346
Fundella pellucens, 26.
Gold tick (*Amblyomma variegatum*), 106.
Green bug (*Nezara viridula*), 45, 262.
Green leaf-hopper (*Tettigonia similis*), 362.
—Grillus integer, 11.
Gryllodes sigillatus, 26.
Gryllotalpa didactyla (mole cricket), 15.
Haematobia serrata (horn fly), 362.
Hard back (*Dyscinetus bidentatus*), 346.
— — grub (*Lachnosterna* sp.,) 197.
Hawk moth (*Pseudosphinx tetrio*), 147.
Hawaiian sugar-cane borer (*Rhabdocnemis obscurus*), 250.
Heliothis obsoleta (boll worm), 10, 147.
Hemileuca lucina, var. latifasciata (buck moth), 298.
Hermetia illucens, 26.
Horn fly (*Haematobia serrata*), 362.
Hypothenemus ritchiei, 10
Icarya purchasi (cottony cushion scale), 330.
Iridomyrmex humilis (Argentine ant), 91.
Laphygma frugiperda (corn ear worm), 10, 147, 346.
Large brown ant (*Prenolepis* sp.), 362
— moth borer (*Castnia licus*), 346.
Leaf-eating caterpillar (*Laphygma frugiperda*), 346.
— — (*Mocis repanda*), 346.
Lepidosaphes, beckii (citrus purple scale), 250. 362.
Locust (*Schistocerca pallens*, 346, 347.
— (*Schistocerca paranensis*), 346, 347.
Macraspis tetradactyla, 26.
Mango tree borer (*Batocera rubus*), 200, 202.
Mangrove borer (*Chrysobothri tranquebarica*), attacking Casuarina,

Insect Pests (*Continued*) :—
May beetles, 362, 363.
Mealy-bug (*Pseudococcus* sp.), 362.
Metachroma rosarum, 26.
Metamasius hemipterus (sugar-cane weevil borer), 250, 346.
— ritchiei, 26.
— sericeus, 26, 250.
Metriona propinqua, 10.
Mocis repanda (leaf eating caterpillar) 346.
Mole-cricket (*Gryllotalpa didactyla*), 15
Monedula signata, 74.
Nezara viridula (green bug), 45, 146, 262.
Novius cardinalis (Australian lady bird), 90, 330.
Oiketicus sp., 26.
Oncideres cingulata, 26.
Ormenis perpusillus, 26.
Ornythodorus magnini, 197.
Oryctes tarandus, 79.
Palaeopus costicollis (sweet potato weevil), 10.
— dioscoreae (yam weevil). 10.
Paracarnus sp., 74
Pea weevil (*Bruchus pisorum*), 266.
Phytalus smithi (brown hard back), 14, 79, 218.
Pieris sp., 26.
Pilocrocis tripunctata (sweet potato leaf-folder), 10.
Pink boll worm, 187.
Plant-sucking bug (*Edessa meditabunda*), 146.
— — (*Nizara viridula*), 146
Plectothrips pallipos, 26.
Polistes annularis (Jack Spaniard), 170.
Freis Nocard bacillus (*Criptococcus farciminosus*), 106.
Prenolepis sp. (large brown ant), 362
Prodenia sp., 231.
— dolichos, 26.
Pseudococcus sp. (mealy-bug), 362
— nipae, 26.
Pseudosphinx tetrio (hawk moth), 147.
Ptychodes trilineatus, 26.
Purple scale (*Lepidosaphes beckii*), 250.
Pyrameis cardui, 114
Pyrausta nubialis (European corn borer), 186.
Red spider (*Tetranychus* sp.), 135
Rhabdocnemis obscurus (Hawaiian sugar-cane borer), 250.
Rhinoceros beetle (*Strategus titanus*), 156.
Root borer of sugar-cane (*Diaprepes abbreviatus*), 14, 330.
Saissetia hemisphaerica (brown shield scale), 362.
Salbergella sp. (cacao bark-sapper), 114
Scalmus intertitialis, 26.

Insect Pests (*Continued*) :—
Schistocerca pallens (locust), 346. 347, 394.
— paranensis (locust), 346, 347, 394.
Sipha flava (yellow cane aphis), 363.
Sitotroga cerealella (Angoumois grain moth). 77.
Smaller small moth-borer (*Elasmopalpus lignoselus*), 346.
Spartocera fusca, 26.
Spring citrus fly (*Aleurocanthus Woglumi*), 30, 350.
Sternodontis dalmicornis, 26.
Strategus titanus (Rhinoceros beetle), 26, 156.
Sugar-cane moth borer (*Diatraea saccharalis*), 146.
— root borer (*Diaprepes abbreviatus spengleri*) 132.
— shot borer (*Xylobras perforans*) 362.
— weevil borer (*Metamasius hemipterus*), 250.
— (*Metamasius sericeus*). 250.
Sweet potato leaf-folder (*Pilocrocis tripunctata*), 10.
— — weevil (*Cylas formicarius*), 10.
— — (*Paleopus costicollis*), 10.
Tetranichus sp. (red spider). 135.
Tettigonia similis (green leaf-hopper), 362
Tomaspis flavilatera (froghopper), 346.
Turpilia punctata, 74.
— Jack Spaniard (*Polistes annularis*, 170.
Typhia, parallela, 79, 298.
Weevil borer (*Metamasius hemipterus*), 346
Wood-ant (*Eutermes morio*), 362.
Worms (*Prodenia* sp.), 231.
Xyleborus perforans (sugar-cane shot borer), 362.
Yam scale (*Aspidiotus hartii*), 10
Yam weevil (*Xalaeopsus dioscoreae*), 10.
Yellow cane aphis (*Sipha flava*), 363.
Yeliow-headed moth borer, (*Diatraea canella*) 346.
Isle of Pines, development of, 29.

J.

Jaboticaba (*Myrciaria cauliflora*), 283.
Jackson, T., 239, 398.
Jamaica, dyewood and chemical factory in, 348.
—, ensilage in, 343
—, exports recent, 299.
— Imperial Association, 105, 297
— logwood, 347.
—, production of orange oil in, 236.
—, record shipments of bananas from, 172.
Jamaican sugar industry, 260
Java, manurial experiments with tobacco in, 316.

Java sugar industry unsettled, 281.
Jippi-Jappa (*Carludovica palmata*) 359.
'John Bull' tree (*Thespesia populnea*), 45.
Johnson grass (*Sorghum halepense*), 39.
Jones, G. A., 19, 227.
Jute cultivation in Brazil, prospects of, 246.
— sacks for use in Cuban sugar industry, 28.

K.

Kapok, use of, as surgical dressing, 124.
Kelp, potash production from, 108.
Kew, the great flagstaff at, 329.
Keys, Alfred, 284, 293.
Knapp, A. W., 228.
Kola on the London market, 61, 95, 23, 143, 191, 223, 253, 303, 335, 367, 399.
Kosteu Curse' (*Clidemia hirta*), 137, 269.

L.

Labour and emigration, 329.
Lancium domesticum, 200.
Laudium domesticum ('Duku'), 329.
Land settlement, private, in Antigua, 328.
— values in Barbados, 124.
Leather, fish-skin, 409.
Lebidibia coriaria (divi-divi), 204.
Lecythis Zabucajo (Sapucaia nut), 283.
Legume, in praise of the, 247.
Legumes, maize inter-cropped with, 35.
Lemon (*Citrus medica*), 172.
Lightning, effect of on Hevea rubber. 309.
Lima bean, large white-seeded, in Grenada, 229.
Lime cultivation in Dominica, 100, 118, 142, 158, 165.
— juice factory, Demerara, 310.
— on the London market, 15, 61, 95, 143, 191, 223, 253, 367, 369.
— oil on the London market, 95, 123, 191, 223, 253, 303, 367.
— trees in Montserrat, improvement of, 227.
Liming, effect of, on crop yields, 41.
Limes, bringing in, on an estate in St. Lucia, 319.
—, budded, 327.
—, green, condition of when shipped, 169.
—, —, wastage of, 139, 281.
Live stock, diminution of during war, 316.
— — in Antigua, health of, 276.
Logwood, Jamaica, 340.
Lonchocarpus cyanescens, 267.
Louisiana, sugar-cane cultivation in, notes on, 115.
—, sugar production in, 204.

M.

Mace on the London market, 15, 123, 223, 303, 367, 399.
Madras, new varieties of sugar-cane in, 236.
—, palm sugar production in, 211.
—, sugar-cane cultivation in, 341.
Mahoe cochon tree (*Sterculia caribaea*), in relation to the cotton stainer, 154, 155, 341.
— — or 'John Bull' tree (*Thespesia populnea*), 154.
Mahoganies, the true, 297.
Maiden's blush (*Momordica charantia*), 74.
Mail service, Indo-Burma aerial, 335.
Maize inter-cropped with legumes, 35
— oil, food value of, 56.
—, root system of, 8.
Malachra capitata (wild ochro), 155.
Malaria, treatment of, 251.
Malaya, fruit culture in, 329
—, rubber research in, 297.
Man, food requirements of, 216.
Manatee as a food animal, 181.
Manatus latirostris (American manatee), 181.
—senegalensis (Senegal manatee), 181
Manchester, cotton trade in, 403.
Manganese mines, Cuban, 316.
Mango (*Mangifera indica*), 202.
Mangosteen (*Garcinia mangostana*), 164.
Mangrove (*Rhizophora mangle*), 11, 282
Manicou (*Didelphis Nudicavdata*). 325.
Manure farmyard, making without animals, 361.
—, liquid, advantages of for garden crops, 172.
— making in Maritius, 411.
Manurial experiments, disturbing factors in, 302.
Manures, chemical, West Indian imports of, 344, 377.
Map of the world's sugar production, 247.
Marine enterprise at the Bahamas, 233
Market Reports. 16, 32, 48, 64, 80, 96, 112, 128, 144, 160, 176, 192, 208, 224, 240, 256, 272, 288, 304, 320, 336, 352, 368, 384, 400, 416.
Mauritius, Casuarina woods in, 51.
—, manure making in, 411.
Maxwell-Lefroy, Prof. H., 227.
Meade cotton, 294.
Meal, molascuit and megass, 52.
Medicago denticulata, 325.
Megass for paper making, 205
Mephitis mephitica (North American skunk), 361.
Mexican apple (*Casimiroa edulis*, 283.
Mexico as a sugar producer, 252.
Michelia champaca, 284.
Milk, added water in, calculation of, 285.
—, adulteration penalties, 309.
Milk, sanitary, production of, 251.
'Million' (*Girardinus poeciloides*), 8, 9.
Mitragyne stipulosa, 248.
Molasses, industrial alcohol made from, 84.
—, standardization of, 36.
—, utilization of, 37.
Momordica charantia (Maiden's blubs) 56, 74.
— cochinchinensis, 56, 163. 477, 393
Mongoose in St. Croix, extermination of, 28.
— in Trinidad, food of, 138.
Montserrat, agricultural outlook in, 221.
—, cotton crop in, 134.
—, — pests in, 182.
—, — stainers in, destruction of food-plants of, 153.
—, items of local interest, 22, 43, 87, 127, 166, 196, 231, 263, 308, 324, 404.
—, lime trees in, improvement of, 227.
—, shipping cotton at, 310.
—, sweet potato, in, remarkable yields of, 359.
Moon and crops 309.
—, effect of, on plants, 415.
Moringa pterygosperma (horse radish tree), 164.
Mote's interchangeable hand plough, 316.
Motor tractors for St. Vincent, 301.
Murraya (chalcas) exotica (citronella), 142.
— exotica (orange jasmine), 360.
Myrciaria cauliflora (Jaboticaba, 283.

N.

Naphthalene, storing in sacks, 282.
Nasturtium officinale (water-cress), 216.
'Nature Study,' 183.
Nelumbium speciosum (pink lotus), 364.
Nephelium lappaceum (Rambutan), 283.
— mutabile, 283.
Nevis, agriculture in, 55.
—, close season for cotton in, 88.
—, coco-nuts and vanilla in, 259.
—, items of local interest, 43, 75, 111, 133, 167, 212, 253, 286, 308, 382, 388.
Nicaragua shade tree (*Gliricidia maculata*), 100, 101.
Nigeria, indigo of, 267.
—, sugar and tobacco prospects in, 371.
Nipa fruticans (Nipah palm), sugar and alcohol from, 340.
Nitrate, early application of, 345.
Nitrogen fixation from air, 252.
— — in tropical soils, 296.
North American skunk (*Mephitis mephitica*), 361.
Notes, personal, 227.
Nowell, W., 293, 379.
Nutmegs on the London market, 15, 123, 223, 367, 399.

O.

Ochro, wild (*Malachra capitata*), 155.
Ochroma lagopus (cork wood), 202.
Ocuje (*Calophyllum Calaba*), 251.
Oil, Aleurites, 396.
—, coco-nut, shipping in bulk, 309.
—, maize, food value of, 56.
—, orange, 184.
— —, production of in Jamaica, 236.
— palm (*Elaeis guineensis*), 164, 380.
— prospecting in Barbados, 348.
—, rubber seed, 309, 376
—, wormseed, 152.
Oils, essential, prices of, 31.
—, vegetable, demand for, 243.
Oona (*Touchardia latifolia*), 287.
Onion growing in Dominica, 91, 136, 319.
— — in Grenada, 374.
— seed, storage of, in the tropics, 375.
Orange (*Citrus aurantium*), 172.
— jasmine (*Murraya exotica*), 362.
— oil, 184.
— — production in Jamaica, 236.
Oranges, shedding of, 215.
Oreodaphne foetens (rain tree of Hierro), 252.
Orotea (Oreodaphne) foetens ('til'), 135.

P.

Palm sugar production in Madras, 211.
Pampoemousse tree (*Citrus decumana*), 380.
Papaw, a freak, 271.
— (*Carica papaya*), 202, 205.
— fruit, increased size of, 351.
Paper yarn, 46.
Para rubber (*Hevea brasiliensis*), 202.
— — industry in Uganda, 172.
Passiflora quadrangularis (granadilla), 164.
Patron Saint, the, 239.
Peanut production in the United States 28.
Pecoary (*Dycoteles Torquatus*), 325.
Pen manure, new facts concerning, 307.
Perishable products, preservation of with burnt lime, 413.
Persea gratissima (avocado pear), 202.
Peru, sugar production in, 44.
Phaseolus lunatus variety, 229.
Philippines, coco-nut products in the, 150.
—, poultry in the, 23.
Phormium tenax, 60.
Phosphate in Barbuda, 136.
Physiology, recent work in, 311.
Pigeon pea (*Cajanus indicus*), 165, 298.
Pimenta acris (Bay tree), 199, 350.
Pimento oil on the London market, 123.
— on the London market, 15, 61, 123, 143, 191, 223, 303, 335, 367, 399.
Pine-apple cider, 268.
— cloth as made in China, 377.
Pine-apple culture in Cuba, 311.
— cultivation in Queensland, 44.
— guava tree (*Feijoa Sellowiana*), 110.
Pine-apples in the Bahamas, 147.
Pink lotus (*Nelumbium speciosum*), 364.
Pinus Sabiniana (Digger pine), 300.
Pithecolobium Saman (Guango), 164, 348.
Plantain stalks as fodder for cattle 403.
Plant, a solanaceous forage, 235.
Plant Diseases and Fungus Notes:—
Aegerita Weberi, 30.
Alternaria citri, 215.
Aschersonia aleyrodis, 30.
Bacillus, soli 414.
— mesentericus vulgatus, 30.
Bacterium coli, 30.
Bracket fungus (*Fomes lucidus*), 14.
Cacao canker fungus as a cause of coco-nut bud rot, 414.
Canker (*Phytophthora faberi*), 302
Citrus canker (*Pseudomonas citri*,) 142.
Chinch bug fungus (*Sporotrichum globuliferum*), 154, 155, 341.
Colletotrichum falcatum (red rot), 146.
— glœosporioides, 255.
Corticium vagum, var. solani, 30.
Fomes lucidus (bracket fungus), 14.
Fusarium radicicola, 30.
— vasinfectum, 30.
Glœosporium limeticolum, 254.
Himantia stellifera, 174.
Investigation of the froghopper pest and disease of sugar-cane, 174, 190, 206, 222.
Marasmius Sacchari (root fungus of sugar-cane), 14, 174, 284.
Mottling disease of sugar-cane in Porto Rico, 62.
Observations on eel worm (Ufra) disease of rice, 94.
Odontia Sacchari, 174.
— saccharicola, 174.
Physoderina sp., 252.
Phytophthora faberi (canker), 302, 414.
— infestans, 30.
Plant diseases in Jamaica, 30.
Pseudomonas citri (Citrus canker), 142, 200.
Pythium palmivorum, 30, 414.
Red ring disease of coco-nuts, 398
— rot (*Colletotrichum falcatum*), 146.
Root disease of sugar-cane (*Marasmius Sacchari*) in Natal and Zululand, 204.
— — or red ring disease of coco-nut palms, 46.
— fungus of sugar-cane (*Marasmius Sacchari*), 14, 174, 284.
— rot or Mal-di-gomma on limes, 62.
Rostrella coffeae, 30.
Sporotrichum globuliferum (chinch bug fungus), 154, 155, 341.
Plant Diseases & Fungus notes (*Con.*)—
Summary of notes on fungi and plant diseases in 1918, 14.
Susceptibility of a non-rutaceous plant to citrus canker, 200.
— — rutaceous plants to citrus canker, 142.
Tylenchus augustus, 94.
Verticillium heterocladum, 30.
Wither-tip of limes in Trinidad, 254.
Plant legislation in Antigua, 105.
— — — Dominica, 292.
— — — Grenada, 136, 169.
— — — St. Lucia, 121.
— — — St. Vincent, 237.
— quarantine, difficulty in enforcing, 200.
— susceptibility of a non-rutaceous, to citrus canker, 200.
Plants affecting the sense of taste, 77.
—, heat production in, causes and conditions of, 283.
—, hedge, desirable, 105.
—, new, at the Dominica Gardens, 283.
— poisonous to stock in Antigua 168.
—, quarantine on in the United States, 195.
—, susceptibility of rutaceous, to citrus canker, 142
Plumieria spp. (frangipani), 147.
Pois doux (*Inga laurina*), 100.
Pomegranate (*Pumica Granatum*), 11.
Pomelo (*Citrus decumana*), 172.
Porto Rico Agricultural College, 365.
—, immune variety of sugar-cane for, 203.
—, vanilla a promising crop for, 245.
Potash and cotton-seed meal, 278.
— production from kelp, 106.
— salts in the United States of America, 25.
Potatoes, sweet, 185, 359.
Poultry, feeding with sea-weeds, 12
— in the Philippines, 23.
— manure, 200.
— susceptible to salt, 76.
Poutaria suavis, 283.
Preservation of perishable products with burnt lime, 159.
Prices of essential oils, 31.
Prize holdings competition, St. Lucia, 1918-19, 319.
Profit sharing in a West Indian sugar factory, 19.
Prosopis juliflora (algaroba), 164.
Publications, Imperial Department, 376.
Punica Granatum (pomegranate), 11.

Q.

Queensland, pine-apple cultivation in, 44.
Quiscalus fortirostris (Barbados black bird), 262.

R.

Rabbit skins, market for, 28.
Rainfall, abnormal, in St. Kitts, 168.
— in Dominica in 1918, 104.
— — Antigua, 183.
Rain tree of Hierro (*Oreodaphne foetens*), 252.
—, weight of, 207.
Rambutan (*Nephelium lapaceum*), 283.
Rats, and their extermination, 399.
— in the West Indies, 406.
—, simple remedy for destroying, 204
troublesome in Trinidad, 315.
Records, value of, 232.
Red mangrove (*Rhizophora mangl.* 282.
Remora sp. (fisherman fish), 293.
Research station, zoological, in the tropics, 89.
Rhizophora mangle (mangrove), 11, 28, 2.
Rice experiments in Trinidad, 343.
— factory, Demerara, 310.
—, hill, in Antigua, 277.
—, shortage of, 264.
— situation in Demerara, 285.
— straw, utilization of, 284.
—, West Indian, 207.
River estate, Trinidad, 360.
Roads, concrete advantages of, 172.
Root nodules and Casuarina, 393.
Rosella (*Hibiscus sabdariffa*), 201.
Rothamsted Experimental Station, 53.
Royal Society of Arts medals, 46.
Rubber, Castilloa, 335.
— Ceara (Chyrysothanmus nauseosus), 131,
— cultivation in British Guiana, 135
— — — Hainan, 409.
— exports from India, in 1917-18, 220.
—, Hevea, effect of lightning on, 309.
— manufactures in United States, value of, 124.
—, new facts concerning, 358.
— Para, industry, in Uganda, 172.
— research in Malaya, 297.
— seed oil, 309, 376.
— selection, 227.
— trees, selection of, 379.
— —, tapping, cuts in, 268.

S.

St. Croix Agricultural Experiment Station, 99.
—, — cane planting on the flat in, 203-
— — experiment station, some acheivements of, 365.
— —, extermination of mongoose in, 28
— —, weather in, 317.
St. Kitts, abnormal rainfall in, 168.
— —, items of local interest, 22, 75, 78, 127, 167, 197, 252, 263, 308, 324, 382, 404.
— —, sugar factory in, 36.
St. Kitts, vanilla curing in, 275.
St. Lucia, agricultural credit societies in 246.
— —, bringing in limes at, 319.
— —, exports from, 359,
— —, items of local interest, 43, 55, 86, 126, 166, 196, 230, 286, 308 340, 383.
— —, plant legislation in, 121.
— —, prize holdings competition 1918-19; 319.
— —, war-time food production in 213.
St. Vincent, acreage under cotton in, 7
— —, cotton in, 9.
— — — crop, past season's, 230,
— —, legislation in, 38.
— —, insect eating birds in, protection of, 15.
— —, items of local interest, 7, 22, 55 86, 133, 150, 196, 230, 262, 324 340, 382.
— —, plant legislation in, 237.
— —, foodstuffs in, prservation of, 77.
— —, Government cotton ginnery, 88.
— — granary, 231.
— —, Indian corn in, 327.
— —, motor tractors for, 301.
Salubrities, 239.
Salt industry of the Turks and Caicos Islands, 12.
—, tolerance of, by the sugar-cane, 356
Saman tree (*Pithecolobium Saman*), 348
Sandalwood oil, West Indian, warning Saagainst use of, 236.
Sandericum radiatum, 164.
Sands, W. N., 328.
Sanitation in British Guiana, 60.
Sapucaria nut (*Lecythis Zabucajo*), 283.
Sarawak bean (*Dolichos Hosei*), 72, 73, 88.
Sarsaparilla on the London market, 15 61, 95, 123, 143, 191, 223, 303; 335, 367, 399.
School, a floating, 218.
— gardens, 83.
Science in cacao production, 141.
Scilla maritima, 399.
Seaside grape (*Coccoloba uvifera*), 322, 397.
Sea-weeds, poultry fed with, 12.
Seed-beds, steam sterilization of, 37.
Seed disinfection by formaldehyde gas, 252.
Seeds, electrical treatment of, 367.
Senegal manatee (*Manatus senegalensis*), 181.
Sesbania grandiflora, 164.
Settlers, assisted, in South Africa, 210.
—, new, opportunities for in the West Indies, 360.
Shea butter tree, 283.
Sheep, Southdown, introduced into Trinidad, 284.
Shepherd, F. R., 359.
Sida acuminata, 182.
— carpinifolia (twelve o'clock), 182.
Sideroxylon dulcificum, 77.
Sierra Leone, Brimstone tree of, 248.
Silk-cotton tree (*Eriodendron anfractuosum*), 45, 155, 202.
—, use of as surgical dressing, 124.
Silos and ensilage, 258.
Sisal (*Agave sisalana*), 35, 106.
— and henequen, 106.
— cultivation in British East Africa, 35.
— — — the East Africa Protectorate, 220.
— — — Antigua, 220, 277.
Skunks and toads, 361
Slugs (*Veronicella occidentalis*), 182.
Snake gourd (*Trichosanthes anguina*), 137.
Soap nuts on the London market, 223.
Sodium nitrate as a manure for cassava, 316.
Soil acidity, new method of determining, 232.
— aeration, 95.
— classification, 281.
— deficiencies, 265.
Soils, heated, influence of, on growth, 249.
—, liming of, 217.
—, tropical, nitrogen fixation in, 296.
Solanum bullatum, 235.
— grantiflorum, 235.
— machanthum, 61
— melongena (egg plant), 61.
— robustum, 61.
— Wendlandii, 16.
Sonchus oleraceus (sow thistle), 92.
Sorghum halepense (Johnson grass, 99.
Sorghums, the grain, 29.
South Africa, assisted settlers in, 210.
— African grasses for paper making, 39.
— American sugar producing countries, 124.
Southdown sheep for the St. Madeleine estates, Trinidad.
Sow thistle (*Sonchus oleraceus*), 92.
Spigelia anthelmia (wormweed), 169.
Spilanthes uliginosa, 169.
Sponges, cultivation of, 194.
— from the British Virgin Islands 313.
Soy bean, 201.
Spondias lutea (hog plum), 202.
Stable manure as a phosphatic fertilizer, 57.
Star apple (*Chrysophyllum cainito*), 164.
Stenotaphrum glabrum, syn., complenatum, 51.
Sterculia caribaea (mahoe cochon tree), 341.
Stevia rebaudiana, 77.
Stizolobium sp. (velvetbean 94, 207.
Studies of Tropical American Phamegrams', No. 3, 381.
Sucking fish, 275.
Sugar and alcohol from the Nipah palm (*Nipa fruticans*), 340.
— and tobacco prospects in Nigeria, 371.

Sugar cane, chlorosis of, 68.
—, — in, prevention of, 211.
—, coefficient of maturity of, 25.
— cultivation in Louisiana, notes on, 115.
— — — Madras, 341.
— — — Uganda, 232.
— immense variety for Porto Rico, 203.
— intested by nematodes, 236.
—, introduction into the West Indies, 242.
—, measuring the growth of, 233.
—, new varieties in Madras, 236.
— sets, germination results, 318.
—, planting on the flat in St. Croix, 203.
—, tolerance of salt by, 356.
— varieties and froghopper blight, 343.
— — under cultivation in British Guiana in 1918, 315.
— versus beet, 312.
Sugar-canes crushed at the Antigua and St Kitts sugar factories, sucrose con tent of, 116.
—, sucrose content of, deterioration in 169.
Sugar, Cuban exports committee for, 89.
— cultivation in Egypt 156,
— — in Germany, 211.
— factory, a West Indian, profit-sharing in, 19.
— factories fuel oil for, 356
— —, West Indian, report on two, 39.
—, glycerine from, 89.
— imports into the United States, 124.
— production in Louisiana, 204.
— — — Peru, 44.
— — — the British Empire, 189.
— —, the world's, map of, 247.
— prospects, German, 402.
— statistics, colonial, 226.
— technology, training in Hawaii in, 261.
—, unrefined, imports from British West Indies into the United Kingdom, in 1918, 316:
—, virtues of, 243.
Sugar Industry :—
A big Cuban association 306.
Cane *versus* beet sugar, 3.
Cost of production in the 248.
Cuban, sugar industry, jute sacks for use in, 28.
— ... —, past and present. 148.
Hawaiian, sugar industry development of, 103.
Granulated white beet sugar and white plantation cane sugar, 334
Impressions of an American sugar chemist in the West Indies, 354.
Impressions of a sugar chemist in the French West Indies 37.
Industrial alchohol made from molasses 86
Jamaican, sugar industry, 260.
Java sugar industry unsettled, 281.
Sugar Industry (*Continued*) :—
Louisiana, syrup-making process in 69.
Molascuit and megass meal, 59.
Standardization of molasses, 36.
Sugar by-produts in Hawaii, 52.
— factories in Antigua and St. Kitts, 36.
— industry in Formosa, 69.
— — — Guadeloupe, 84.
Syrup-makiug process n Louisiana, 60.
— Utilization of molasses, 375. 37.
— outlook for 1920-30 375.
Sugars, polarization test of, 409.
Sugar-producing countries, South American, 124.
Sulphate af ammonia and nitrate of soda, combined use of, 73.
Sawn hemp, (*Cortalaria juncea*), 165 12
— — — in Grenada, 413.
Suwarri nut (*Caryocar nuciferum*), 283
Sweet lime or myrtle lime (*Triphasia tripholiata*), 142.
— potato in Montserrat, remarkable yields of, 359.
— potatoes, production in United States, 44.
— sop (*Anona squamosa*,) 26.
Swietenia humilis, 297.
— macrophylla, 297.
— mahagoni, 297.
Swine fever, 264.
Sword bean (*Canavalia ensiformis*), 55

T.

Tamarinds on the Laudon market, 15 61, 95, 143, 191, 223, 253, 303 335, 367, 399
Tamboukie grass (*Andropogon auctus*), 39.
— (*Andropogon Dregeamus*), 39.
— grasses (*Cymbopogon Nardus*, var. *validus*), 39.
Tangelos, 199.
Tannias and eddoes, cause of acridity of, 57.
Tea, aroma of, 412.
— cultivation in Ceylon, 44.
Teak (*Tectona grandis*), 291.
Temple of Agriculture, 239.
Teneriffe, Gacia plants from 9.
Tephrosia candida, 74, 100, 110, 119. 165.
Terminalia cattapa (almond), 26.
Thatching grass or 'dek gras' (*Andropogon Buchanani*), 39.
Thespesia populnea ('John Bull' tree) 45, 154.
Thrinax argentea, 172.
Thymol *versus* chenopodium for hook worm disease, 238.
Ticks in Guadeloupe, 155 .
'Til' (*Orotea* [Orodaphne] *foetens*). 135.
Timber industry of British Honduras, 172.
Toad (*Bufo marinus* or *B. agua*), 361. 378.
Tobacco, controlled fermentation of, 279.
—, Imperial preference and, 279.
—, manurial experiments in Java, 316.
— trade, Honduras, 44.
Tobago, development of, 44.
—, hat making industry in, 172.
Tomatoes, hand-pollination of 397.
—, increasing the yields of, 381.
— in the Pahamas, 147.
Tonka bean (*Dipterix odorata*), 110.
Top-minnows' (*Gambusia affinis*), 8, 9.
Tortola cotton factory, 333.
Touchardia latifolia (Olana), 287.
Tractor and plough, 'Twin City', 278.
— demonstration in Barbados, 301.
—, the work of, 349.
Tractors, employment of, 247.
—, motor, for St. Vincent, 301.
Trade and sugar crop of Cuba, 43.
— prosperity, Canadian, 293.
Transport, a new form of, 387.
Travancore, coco-nut cultivation in, 342.
Trees, citrus, pruning 93.
—, diseased, injection of antiseptics into, 379.
—, rubber, selection of, 379.
—, precipitation of fog moisture by, 134.
Trichosanthes anguina (snake gourd), 137
Trinidad, agricultural credit societies in, 249.
— Agricultnral Department and Board of Agriculture reorganization of, 47.
— — exhibition, 104.
—, — re-organization in, 393.
—, bamboo paper pulp manufacture in 220.
— Board of Trade, 281.
—, cacao experiments in, 87
—, cassava experiments in, 109, 126.
—, coco-nut industries of, 163.
— credit societies, address to 285.
— exports, 315.
—, — of gasolene from, 268
—, forestry in 291.
—, mongoose in, food of, 38.
—, rats troublesome in, 315.
—, rice experiments in. 343.
—, River estate, 360.
—, Southdown sheep introduced into, 284.
Triphasia trifoliata (sweet lime or myrtle lime). 142.
Tropics, zoological research station in the, 89.
Turks and Caicos Islands, cotton Ordinance in, 121.
— — — —, industries of 59.
— — — —, salt industry of, 12
— Islands, method of curing fish in, 229.

Twelve o'clock (*Sida carpinifolia*), 182.
'Twin City' tractor and plough, 278.

U

Uganda, Para rubber industry in, 172.
— sugar-cane cultivation in, 232.
Ukers, John Charles, 392.
United Kingdom, afforestation in, 28.
— —, demand for industrial alcohol in, 101.
— —, imports of unrefined sugar from British West Indies in 1918, 316.
— States of America, potash salts in, 25.
— —, official cotton standards of, 198.
— —, peanut production in, 28.
— —, quarantine on plants in, 195.
— —, rubber manufactures in, value of, 124.
— —, sugar imports into, 124.
— —, sweet potato production in, 45.

V.

Vanilla, a promising crop for Porto Rico, 245.
— curing in St. Kitts, 275.
— in Nevis, 259.
— (Vannilla planifolia 270, 275.
Vegetable dye rediscovered, 184.
Vegetables, sundrying of, 92.
Velvet beans (*Stizolobium* spp.) for stock food, 94, 207.
Venzuela, cotton growing in, 50.
Virgin Islands, British, sponges from, 313.
— —, items of local interest, 22, 75, 127, 133, 167, 197, 383, 388.
Vitamines, 212.
Volcano, a great, model of, 312

W.

War materials as fertilizers, 393.
Waste in movement stopped, 395
Water-cress (*Nasturtium officinale*), 216.
Water, filtered, 409.
— hemp (*Bidens coreopsides*), 169.
— hyacinth (*Eichornia crassipes*), 92
— in milk, added, calculation of, 285.
— power, 217.
— weed (*Cymodocea nodosa*), 181.
Watts, Sir Francis, 357, 379.
Weather and the moon, 287.
— in Antigua, 389.
— — St. Croix, 317.
Weed seeds, buried, 24.
Weeds, machine for exterminating, 153.
Weight of rain, 287.
'West Indian Bulletin' Vol, XVII, No. 3, 120.
West Indian cotton, 260, 278,
— — imports of chemical manures 244, 377.
— — rice, 217.
— — sandal wood oil, warning against use of, 236.
— — sugar factories, report on two, 391.
— Indies, camphor trees in, 196.
— —, — — — a correction, 40.
West Indies, cotton exports from, 103, 166, 374.
— —, grasses in, 220.
— —, bookworm campaign in, 233.
— —, improvement of yield of Sea-Island cotton in, 125
West Indies, introduction of the sugar, cane into, 242.
— —, opportunities for new settlers in, 360.
— —, present outlook in, 395.
— —, ratsin, 406.
— —, Sea Island cotton production in 39.
Whale meat, canning, 92.
Wild ginger, 73.
Wines, Australian, 11.
World cotton conference, 344.
World's sugar production, map of, 240.
Worm destroyers, 220.
— weed (*Spigelia anthelmia*), 169.

Y.

Yam cultivation experiment in, 40.
Yarn paper, 146.
Yeast, Danish invention for making, 89.

Z.

Zanzibar, cocoanut cultivation in, 60.
Zebra and its hybrids as domestic animals, 25.
Zinziber officinale (ginger), 73.
Zoological research station in the tropics, 89.